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The US Army has documented the need for improved equipment and procedures to provide electronic troubleshooting/diagnostics of helicopter turbine engines. The Aviation Turbine Engine Diagnostic System (ATEDS) development has been initiated to address this need. A key element of the system development requires the creation of detailed, step-by-step, troubleshooting/diagnostic procedures and conversion of this data to electronic format compatible with the overall system. This report documents the activity accomplished by Rolls-Royce Allison in developing this data for application to the OH-58D Kiowa Warrior helicopter.

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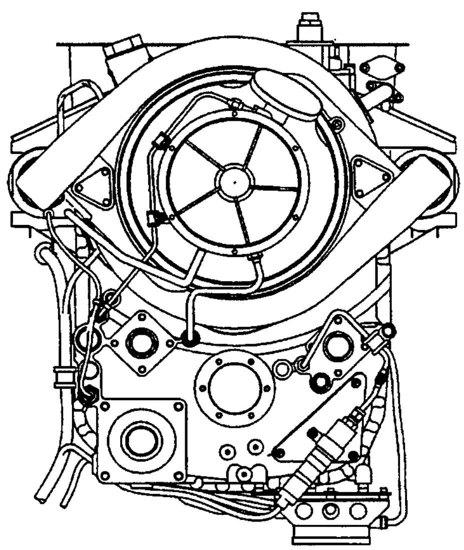
Development and SGML-Tagging of Troubleshooting and Diagnostic Procedures for Rolls-Royce Allison T703-AD-700 and 250-C30R/3 Engines, and 250-C30R/3 FADEC



U.S. Army Contract DAAJ02-97-C-0014

Aviation Turbine Engine Diagnostic System (ATEDS)

19 July 1999

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1.0 Foreword

The U.S. Army is currently using old test equipment and incomplete troubleshooting procedures to diagnose engine and engine-to-airframe faults on OH-58D Kiowa helicopters. Mechanics often replace numerous components, without adequate troubleshooting, until the fault is corrected. The practice is expensive, creates a burden on the logistics system, and adversely affects aircraft readiness.

The U.S. Army Aviation Center has documented the need for improved equipment and procedures to provide electronic troubleshooting/diagnostics of helicopter turbine engines, and has initiated development of an Aviation Turbine Engine Diagnostic System (ATEDS) to address this situation. ATEDS will be comprised of portable computers containing interactive software for troubleshooting and diagnosing engine and engine-to-aircraft interface problems, with links to electronic technical manuals (and, eventually, to flight data recorders and automated log books), and specialized test equipment to support the troubleshooting/diagnostic procedures.

As part of the effort to develop the ATEDS, Rolls-Royce Allison was awarded a contract (DAAJ02-97-C-0014) to generate the detailed, step-by-step, troubleshooting/ diagnostic procedures and identify the specialized test equipment necessary to allow the maintainer to perform the troubleshooting/ diagnostics procedures. This report addresses activities related to this system.

2.0 Objectives

The objectives of the contracted effort to which this report is directed are as defined under Tasks I and II of the Statement of Work, as follows.

2.1 Task I

The contractor shall develop the electronic Standard Generalized Markup Language (SGML) tagged datafiles of troubleshooting/ diagnostic procedures for engine and engine-to-airframe interface faults (mechanical and electrical). Engine-to-airframe interface shall refer the maintainer to the procedures and appropriate manual necessary to simulate engine input/outputs to verify operation of airframe instrumentation and the procedures to verify proper engine-to-airframe mechanical/electrical interfaces. The troubleshooting/diagnostic procedures shall be limited to Aviation Unit Maintenance (AVUM) and Aviation Unit Intermediate Maintenance (AVIM) repairs. The procedures shall meet the performance requirements in Appendix A, and cover the following engines and associated airframes.

Engine	Airframe
250-C30R/3	OH-58D
T703-AD-700	OH-58D

2.2 Task II

The contractor shall attend a kickoff meeting at the Aviation Applied Technology Directorate, Fort Eustis, Virginia. The purpose of the meeting is to define a common user interface, among the Army's engine manufacturers, for the electronic troubleshooting/diagnostic procedures. The kickoff meeting shall be held within 30 days after contract award.

3.0 Scope

This report is submitted in fulfillment of requirements of Aviation Turbine Engine Diagnostic System (ATEDS) Contract DAAJ02-97-C-0014, CDRL Items A003, *Technical Report (Draft)*, and A004, *Technical Report (Final)*.

4.0 Summary

Troubleshooting/diagnostic procedures were developed for a total of 159 observed or indicated faults, in the following three categories:

- T703-AD-700 engine
- 250-C30R/3 basic engine (less control system)
- 250-C30R/3 Full Authority Digital Electronic Control System (FADEC)

Each troubleshooting/diagnostic procedure was developed in flow chart format and graphically depicted using Visio 4.0 software. SGML tagging was based on text and logic contained in the Visio flow charts.

The various actions to be performed on the engine and airframe in pursuance of the troubleshooting/diagnostic procedures were, where available, referenced to the corresponding tasks in the engine and/or airframe technical manuals.

Items of specialized test equipment required to perform the various diagnostic procedures were identified.

5.0 Recommendation

It is recommended that this report be accepted as fulfilling the requirements of Aviation Turbine Engine Diagnostic System (ATEDS) Contract DAAJ02-97-C-0014, CDRL Items A003, *Technical Report (Draft)*, and A004, *Technical Report (Final)*.

6.0 Discussion

6.1 Development of Troubleshooting/ Diagnostic Procedures

The following three separate sets of troubleshooting/diagnostic procedures were developed:

- T703-AD-700 engine (with supervisory electronic control system) and engine-to-aircraft interfaces
- 250-C30R/3 engine (except for control system) and engine-to-aircraft interfaces
- 250-C30R/3 Full Authority Digital Control System (FADEC) and FADEC-to-aircraft interfaces

For each of these categories, a set of observable or detectable symptoms was established and possible causes defined. A fault isolation/correction procedure was then developed for each symptom, considering all of the defined possible causes. The symptoms and the possible causes are presented in the following tables:

	Category	No. of procedures	Table No.
6.1.1	T703-AD-700 engine	51	I
6.1.2	250-C30R/3 basic engine	51	II
6.1.3	250-C30R/3 FADEC	57	III

Table I. List of faults for which isolation and correction procedures were developed: T703-AD-700 engine.

Item*	Symptom	Possible causes or sources
ST-1	Starter unable to motor engine to fuel introduction speed	Low battery. Degraded starter. GG rotor rub or drag. Inlet or exhaust blockage
ST-2	Engine fails to light off	Air in fuel control or fuel lines. Aircraft battery. Faulty circuit to ignition unit. Faulty ignition exciter. Faulty spark igniter. Insufficient fuel in tank. Fuel control in cut off. Insufficient fuel pressure to fuel pump. Fuel nozzle valve stuck or orifice clogged. Fuel pump inoperative. Water or other contaminant in fuel. Improper fuel nozzle shimming. Combustor, outer combustion case. GGT 1st stage nozzle shield.
ST-3	Engine lights off prior to reaching fuel introduction speed. (Premature light off).	Fuel control cut off valve not closed. Combustor drain valve stuck closed
ST-4	Engine lights off normally but acceleration rate is slow with low TGT. May stagnate (hang) at around 30% Ng	Restricted fuel supply. Anti-icing or accessory bleed air on or leaking. Pneumatic leak in fuel control air sensing tubes or accumulators. Fuel control schedule shifted low. Electronic supervisory control. Excessive compressor air leakage. Low inlet fuel pressure at fuel pump. Fuel nozzle. Compressor erosion or damage.
ST-5	Engine lights off normally but acceleration rate is slow with higher than normal TGT	TGT indicating system error. Low battery. Degraded starter. Aircraft electrical system. Anti-icing air valve open and/or cabin heat on. Compressor bleed valve stuck closed. Fuel nozzle. Degraded compressor. Degraded turbine. Excessive gearbox load.
ST-6	TGT too high during start.	TGT indicating system error. Residual fuel in combustor. High residual TGT. Low battery. Degraded starter. Fuel nozzle. Excessive compressor bleed or leakage. Fuel control schedule shift. Electronic supervisory control.
ST-7	Engine accelerates to overspeed during start.	Fuel control throttle rigging. Frosting or icing in the fuel control Py governing orifice. Fuel control failure
ST-8	Engine lights off but flames out during ground starts at high altitude, especially above 5,000 ft (1542 meters) at cool temperatures,	Incorrect fuel type. Fuel nozzle coking. Combustor. Outer combustion case. GGT first stage nozzle shield.
ST-9	Compressor surge during starting	Foreign object damage or compressor erosion. Rich fuel control schedule. Bleed valve closing too early or stuck. Electronic supervisory unit.
ST-10	Main rotor (and Np) do not rotate by 25% Ng speed during start	Improper oil type in cold weather. Excess drag in aircraft drive train. Accessory gearbox internal fault.
ST-11	Rich, delayed light-off	Fuel control cutoff valve not fully closed, or leaking. Faulty ignition exciter, lead, or spark igniter. Faulty combustor drain valve. Faulty check valve in engine oil system. Fuel nozzle spray pattern or flow divider, fuel nozzle shimming

Table I (cont)

Item	Symptom	Possible causes or sources
ST-12	No oil pressure indication during start	Oil pump not properly primed. Restriction in oil pump supply line. Low oil level in tank. Dirty oil filter. Faulty aircraft oil pressure sensor or indicator- Leaks within the oil filter housing. Oil pressure regulator sticking. oil pump or oil pump drive failure. Accessory gearbox problem.
RG-1	Engine speed cycles (unstable) at ground idle (61-65% Ng).	Fuel control throttle rigging and/or security. Restriction in fuel supply. Aircraft electrical harness. Fuel control air sensing tube leak or fuel control malfunction. Electronic supervisory control. Compressor bleed control valve
RG-2	RG-2 Engine speed cycles (unstable) at 100% Nr/Np, main rotor at flat pitch.	Np beeper switch. Collective pitch position potentiometer. Fuel control throttle rigging or security, Restriction in fuel supply. Aircraft electrical harness. Fuel control air sensing tube leak. Fuel control malfunction. Compressor bleed valve control. Electronic supervisory control
RG-3	Idle speed does not repeat to the desired set point on repeated throttle movements from, and returning to, idle.	Fuel control throttle rigging or security. Fuel control malfunction. Electronic supervisory control.
RG-4	Idle speed too low. (shifted low from prior setting).	Incorrect fuel control throttle lever setting or idle speed adjustment incorrectly set. Ng tachometer error. Excessive generator load (will result in slightly higher than normal TGT)- Fuel control malfunction. Electronic supervisory control.
RG-5	Idle speed too high. Will not respond to idle speed decrease adjustment. May respond to gross idle speed increase adjustment.	Fuel control throttle lever setting or idle speed adjustment incorrectly set. Ng tachometer error. Fuel control malfunction. Electronic supervisory control.
RG-6	Fuel and/or oil leaking from fuel pump/fuel control overboard drain port.	Fuel pump drive shaft seal leaking. Gearbox seal leaking.
RG-7	Oil emanating from diffuser vent orifice.	Orifice improperly sized.
RG-8	Unable to stop engine with fuel control throttle movement to cut off.	Fuel control cut off valve not properly closing. Fuel control throttle rigging or security.
RG-9	Oil leaking from accessory gearbox drive(s).	There are ten output drive pads on the accessory gearbox, front and rear. Leakage from any of these, except the AGB breather gearshaft seal, can be repaired by replacement of the seal without engine removal.
RGF-1	Engine unstable in power range.	Fuel control throttle rigging or security. Collective pitch position potentiometer. Np beeper switch. Fuel supply restriction, Aircraft electrical harness. Fuel control pneumatic sensing tube leak. Bleed valve cycling. Fuel control malfunction. Electronic supervisory control.

Table I (cont)

Item	Symptom	Possible causes or sources
RGF-2	Compressor surges during acceleration from idle to governing at 100% Np/Nr.	Compressor damage or degradation. Compressor inlet blockage. Pressure or thermal distortion. Bleed valve closing too soon or stuck closed GG turbine 1st stage nozzle area reduced by blockage from ingested sand and dust deposits. Fuel control malfunction. Electronic supervisory control.
RGF-3	Excessive vibration	Engine mount looseness. Engine alignment. Main rotor or tail rotor drive systems. Damage or failure of compressor rotor, GGT, or PT rotor. Main or AGB bearings. GG or PT rotor unbalance. Accessory unbalance. Gear failure. Gear tooth match.
RGF-4	Exhaust duct emitting sparks.	Combustion liner damaged. Turbine or compressor damaged. Fuel nozzle.
RGF-5	Engine Ng or Np overspeeds.	Fuel control throttle linkage rigging or security. Speed measurement systems. Extreme flight maneuver. Output load loss. Engine wiring harness. Fuel control malfunction. Electronic supervisory control.
RGF-6	Excessive exhaust torching during transients.	Fuel nozzle. Fuel control. Electronic supervisory control.
RGF-7	Lack of anti ice air.	Cracked anti ice air tubes. Defective switch. Plug installed in solenoid valve. Anti-icing air valve stuck closed. Solenoid valve not working. Dirt collected in vane exit slots. Valve to scroll gasket.
RGF-8	Magnetic plug warning light.	Engine metal generation.
RGF-9	Faulty torquemeter indication.	Torquemeter bleed clogged. Torquemeter pressure sensing oil line clogged. Torque measurement system. Torque transducer or related wiring faulty. Torquemeter supporting bearing failure. Low main oil pressure
RGF-10	Continuous exhaust smoking.	Restricted power turbine sump scavenge strut or scavenge piping. Degraded oil pump. No. 5 seal leak. No.1 seal leak. Failed No. 5 bearing. Defective turbine seal. AGB breather gear lip seal. Oil transfer tubes. Aircraft scavenging system.
RGF-11	Oil spewing or leaking from gearbox vent and/or tubing joints.	AGB breather gearshaft lip seal leakage. High gearbox pressure caused by diffuser vent orifice too small or damaged. Worn or damaged turbine seals in the cooling air or pressure balance circuits.
RGF-12	Low oil pressure.	Oil level. Oil pressure measurement system. Oil pressure regulator. Engine oil filter. Degraded oil pump. Contaminated oil. Oil transfer tubes. Other internal oil leak. External leak. Oil supply restriction. High oil temperature.
RGF-13	High oil pressure.	Oil pressure measurement system. Oil passage obstruction in AGB. Turbine oil supply restriction.

Table I (cont)

Item	Symptom	Possible causes or sources
RGF-14	Oil pressure drops off severely with normal oil temperature.	Oil level. Pressure measurement system. Oil pressure regulator. Degraded oil pump. Oil transfer tubes. Aircraft oil system flow restriction. Oil foaming.
RGF-15	Oil temperature exceeds 107° C (225 °F)	Oil temperature measurement system. Aircraft oil cooler. Cooler bypass, or thermostat. Cooling fan damaged or obstructed.
RGF-16	Excessive oil pressure fluctuation.	Oil level. Pressure measurement system. Oil pressure regulator. Air in pressure sense line. Oil foaming. Aircraft oil system flow restriction. Oil pump.
RGF-17	Engine oil tank fills during flight as transmission oil level decreases.	Oil transferring through leaking seals at the front and/or rear AGB power output drives.
RGF-18	Transmission oil level increases during flight as engine oil tank empties.	Oil leaking, or being forced, through seals at front and/or rear AGB power output drives.
RF-1	Low power with high TGT.	Ng, Torque, or Np measuring systems. Dirty or degraded/damaged compressor. Degraded turbine. Blocked or distorted inlet. Blocked exhaust. Anti icing system on or leaking. External air leaks. Accessory bleed open. Degraded combustor. No 6 and 7 area labyrinth seals having excessive clearance.
RF-2	Low power with TGT below maximum limits.	Fuel control throttle lever not at its maximum stop Collective pitch to rotor rigging. Restriction in fuel supply. Low inlet pressure to the fuel pump. Dirty fuel filter. Pneumatic leak in fuel control air sensing tubes. Clogged Pc filter or air sensing tube. Improperly shimmed or blocked fuel nozzle. Fuel control malfunction. Electronic supervisory control.
RF-3	Low measured TGT at normal or high power.	TGT Indicator, thermocouple, or harness. Engine electrical harness. Aircraft electrical harness. NOTE: IF THE ENGINE IS PRODUCING NORMAL POWER, THE FUEL CONTROL SYSTEM CANNOT CAUSE A TGT ERROR.
RF-4	Slow to accelerate to power. Rotor droop with collective pitch increase.	Pneumatic leak in fuel control air sensing tubes. Excessive generator load. Bleed valve stuck open. Excessive compressor air leakage. Fuel control. Electronic supervisory control.
RF-5	Oil consumption exceeds one quart per five hours of engine operation.	External leak, engine or aircraft. AGB lip seal leak. No. 1 seal leak. Turbine sump scavenge strut blockage or inadequate scavenging. High AGB case labyrinth seal leak. Dirty scavenge filter.
OFF-1	Bearing noise at compressor which may be accompanied by looseness of the impeller.	This is an indication of a bearing failure.
OFF-2	Engine will not crank. (Started unable to rotate engine).	Electrically failed or defective starter. Binding of compressor, turbine or gearbox.

Table I (cont)

Item	Symptom	Possible causes or sources
OFF-3	Starter will not rotate engine immediately after shutdown.	Binding of rotating components due to differential rate of cooling, or insufficient clearance.
OFF-4	Static oil leakage from power and accessory gearbox breather.	This is an indication that the oil filter check valve is leaking.
OFF-5	Fuel leaking from fuel control seep holes. Leakage may be blue in color and/or blue stain may be found on the lower external surface of the fuel control.	Fuel pump seal leak or fuel pump O-ring leaking.
OFF-6	Afterfire. TGT increase after shutdown indicating residual fire in the combustor	Fuel control cut off valve not fully closed. Oil leak. Sticking combustor drain valve. Combustor drain valve line obstruction.
OFF-7	Exhaust smoking during or immediately following engine shutdown. (Light wisps of smoke can be normal and are not cause for maintenance action unless oil consumption limits are exceeded).	Exhaust collector drain restricted. Combustor drain restricted. Blocked power turbine scavenge strut. Aircraft system scavenge flow restricted. Scavenge flow from turbine restricted. Defective turbine seals. Leaking oil transfer tubes or check valve. Defective oil pump.

* **Item number** code letters indicate engine operating regime to which corresponding symptom applies, as follows:

CODE	operating regime
ST-	engine starting
RG-	engine running, on ground
RGF-	engine running, on ground or in flight
RF-	engine running, in flight
OFF-	engine shut down, not running

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Table II. List of faults for which isolation and correction procedures were developed: 250-C30R/3 basic engine.

Item No.	Operating regime	Fault description	Possible causes or sources
St-2	Start	Compressor surges during starts	ECU/HMU/inducer bleed duct restriction/inlet blockage/thermal distortion/compressor. damage or erosion/turbine blockage
St-3	Start	Flames out after light-off during start attempts at high altitude/cold ambient conditions	Fuel type/fuel nozzle coking/fuel nozzle immersion depth/combustion system
St-4	Start	Rich/delayed light-off	Intermittent (or faulty) ignition/fuel nozzle spray pattern/fuel nozzle flow divider/ECU/HMU/burner drain valve/external or internal lube check valve
St-5	Start	Motors to required speed but does not light off	Fuel supply/water in fuel/ignition/HMU rigging/fuel nozzle shimming/fuel nozzle coking/fuel nozzle flow divider valve stuck/combustor/outer combustion case/GGT 1st stage nozzle shield /HMU/ECU
St-6	Start	Lights off prior to scheduled fuel introduction speed	ECU/HMU/burner drain valve/HMU fuel valve leakage
St-7	Start	Lights off but will not accelerate to idle at normal rate	Fuel supply/compressor damage or erosion/low battery power/degraded starter/fuel nozzle tip carbon or flow divider/anti-icing or accessory bleed air on or air leaks/ECU/HMU
St-8	Start	MGT too high during start	Residual fuel in combustor/high residual MGT/low battery power/degraded starter/fuel nozzle flow divider valve stuck/excessive compressor air bleed or leakage/ECU/HMU
St-9	Start	MGT too low during start	ECU/HMU/MGT harness/MGT indicator calibration/engine electrical harness/engine accessory harness
St-10	Start	No oil pressure indicated during start	Low oil supply/oil pump not primed/oil filter element dirty/internal oil transfer tubes worn or leaking/oil supply restriction/oil pressure sensor or indicator calibration/oil pressure regulating valve stuck/failed oil pump or AGB
St-11	Start	No rotation of Nr/Np by 25% Ng during start	Helicopter rotor system drag/power turbine rotor system drag or lock-up/accessory gearbox power train drag or lock-up/wrong oil in cold environments
St-12	Start	Does not motor to required light-off speed	Low battery/degraded starter/internal oil transfer tubes or check valve leaking, causing AGB fill-up/gas generator rotor rub or drag/aircraft starter electrical circuits
St-13	Start	Starter will not rotate engine	Starter mechanically failed or defective/no voltage to starter/compressor rotor drag/gas generator turbine rotor drag/gas generator rotor frozen by ice/accessory gearbox failure

Table II. (cont)

Item No.	Operating regime	Fault description	Possible causes or sources
R-1	Run	Anti-icing system not operating properly	Electrical power/pilot valve/pilot valve vent/anti-icing air valve/valve-to-scroll gasket/anti-icing air supply tube/air tube from pilot valve to anti-icing valve/dirt in inlet guide vane exit slots
R-2	Run	Compressor surge/stall	ECU/HMU/compressor damage/compressor inlet blockage, pressure or thermal distortion/inducer bleed duct loose or restricted
R-3	Run	Exhaust duct emitting sparks	Fuel nozzle spray pattern/combustor burning or carbon/turbine/compressor rub, bearing failure, ingestion damage
R-4	Run	Exhaust torching during transients	ECU/HMU/fuel nozzle/external air leaks/cabin hearer air leaks/anti-icing system air leaks
R-5	Run	Fuel leaking from HMU overboard drain port	HMU seal leak
R-6	Run	Ground idle speed too high or too low	ECU/HMU/power lever rigging/cockpit speed indication
R-7	Run	Magnetic chip detector warning	Chips/slivers/fuzz/accessory harness/aircraft wiring
R-8	Run	Low measured MGT at normal or high power	MGT harness/accessory harness/engine electrical harness/aircraft wiring/MGT indicator
R-9	Run	Ng or Np overspeed	Speed measurement systems/extreme maneuver/output load loss
R-10	Run	Ng or Np speed not indicating	Speed pick-up/speed indicator/engine electrical harness/engine-ECU interface harness/ECU to speed indicator aircraft wiring
R-11	Run	Oil consumption high (exceeding I quart per 5 hours engine operation)	External leak - engine or aircraft/AGB lip seal leaks/No. 1 seal leak/turbine sump scavenge strut blockage or inadequate scavenging/high AGB case pressure /No. 5 laby seal leak
R-12	Run	Oil leaking from accessory gearbox drive(s)	Drive pad lip seal/wet spline driveshaft seal
R-13	Run	Oil pressure drops off severely with normal oil temperature	Oil level/pressure measurement system/oil pressure regulator/degraded oil pump/oil transfer tubes/helicopter oil system flow restrictions/oil foaming
R-14	Run	Oil pressure fluctuates	Oil level/pressure measurement system/oil pressure regulator/air in pressure sense line/oil foaming/helicopter oil system flow restrictions/oil pump
R-15	Run	Oil pressure too high	Oil pressure measurement system/oil passage obstruction in AGB/turbine oil supply restriction
R-16	Run	Oil pressure too low	Oil level/oil pressure measurement system/oil pressure regulator/engine oil filter/oil transfer tubes/external leak/oil supply restriction/high oil temperature

Table II. (cont)

Item No.	Operating regime	Fault description	Possible causes or sources
R-17	Run	Engine oil tank fills during flight as aircraft transmission oil level decreases	PTO lip seal/aircraft overrunning clutch scavenge pump
R-18	Run	Aircraft transmission oil level increases during flight as engine oil tank empties	PTO lip seal/AGB case pressure (compressor seal vent pressure, turbine inner balance piston seal)/damaged lip seal land on PTO gearshaft
R-19	Run	Oil spewing or seeping from diffuser vent orifice and tubing joints	Compressor seal vent pressure set too low/bent or distorted tube flanges
R-20	Run	Oil spewing or seeping from gearbox vent and tubing joints	AGB air-oil separator gear lip seal/high AGB case pressure from compressor seal vent pressure set too high, or turbine inner balance piston seal wear or damage/bent or distorted tube flange
R-21	Run	Oil temperature exceeds 107° C (225°F)	Oil temperature measurement system/helicopter oil cooler, cooler bypass, or thermostat/cooling fan damaged or obstructed
R-22	Run	Power low with high MGT	Torque or MGT measurement systems/dirty compressor/damaged or degraded compressor or turbine/blocked or distorted compressor inlet/compressor inducer bleed blocked /anti-icing system on/external air leaks/accessory bleed open/degraded combustor
R-23	Run	Power low with MGT below maximum limit	Power lever rigging/collective pitch-to-rotor rigging/fuel restriction, low fuel inlet pressure, dirty fuel filter/ECU/HMU
R-24	Run	Slow acceleration/NP droop	Collective pitch potentiometer rigging or fault
R-25	Run	Smoking during steady state operation	Restricted power turbine sump scavenge strut or scavenge piping/degraded oil pump/No. 5 laby seal/AGB breather gear lip seal/oil transfer tubes/No. 1 bearing or oil seal/aircraft scavenging system/worn turbine seals
R-26	Run	Smoking during transients	Restricted power turbine sump scavenge strut or scavenge piping/degraded oil pump/No. 5 laby seal/AGB breather gear lip seal/oil transfer tubes/worn turbine seals
R-27	Run	Faulty torquemeter indication	Cockpit torque measurement system/engine torquemeter/engine torquemeter transducer or related wiring/obstruction in oil tube from engine to transducers/low main oil pressure/ECU
R-28	Run	Unstable in power turbine governing (95%--105% Np)	ECU/HMU/power lever rigging and security/collective pitch position potentiometer/Np beeper switch/fuel supply restriction/engine, accessory, interface, or aircraft electrical harness

Table II. (cont)

Item No.	Operating regime	Fault description	Possible causes or sources
R-29	Run	Unstable at ground idle	ECU/HMU/power lever rigging and security/fuel supply restriction/engine, accessory, interface, or aircraft electrical harness/Ng speed measuring system
R-30	Run	Vibration excessive	Mount looseness/engine alignment/helicopter drive system/damage or failure of compressor rotor, GGT or PT rotor/main or AGB bearing(s)/GG or PT rotor unbalance/accessory unbalance/gear failure/gear tooth mesh
Sd-1	Shutdown	Afterfire (rising MGT after shutdown)	HMU/power lever rigging/burner drain valve/turbine internal oil leak
Sd-2	Shutdown	Compressor bearing noise or loose compressor rotor	Front compressor bearing/rear compressor bearing
Sd-3	Shutdown	Smoking during shutdown	Exhaust collector drain/leaking No. 5 laby seal/AGB air-oil separator gear lip seal/oil transfer tubes/oil check valve to turbines/burner drain valve/restricted scavenge to turbine sumps/defective turbine seals/oil pump/restricted aircraft oil system
Sd-4	Shutdown	Unable to stop engine with twist grip	HMU/power lever rigging/aircraft throttle linkage
Off-1	Off	Filter (engine fuel) impending bypass indicator extended	Dirty filter element/ contaminated fuel system/faulty pop-out
Off-2	Off	Filter (main oil) impending bypass indicator extended	Dirty filter element/contaminated oil/faulty pop-out
Off-3	Off	Oil reservoir level lowering with engine inoperative	Internal oil check valve/oil transfer tube leaks at oil filter housing/other internal AGB oil leaks or scavenge pump problems/aircraft system restrictions
Off-4	Off	Oil runs from burner drain valve after shutdown	Internal oil check valve/external oil check valve
Off-5	Off	Starter will not rotate engine immediately after shutdown	Turbine blade tip rub/compressor rub/AGB GG gear train failure

Table III. List of faults for which isolation and correction procedures were developed: Model 250-C30R/3 FADEC.

Item No.	FADEC fault category	Maintenance terminal fault code	Fault description
1	STEPPER MOTOR CIRCUIT FAULT	SmFlt	Stepper motor fault
		SmPhAVFlt	Stepper motor phase A voltage fault
		SmPhBVFlt	Stepper motor phase B voltage fault
		SmPhCVFlt	Stepper motor phase C voltage fault
		SmPhDVFlt	Stepper motor phase D voltage fault
		SmPhIFlt	Stepper motor phase current fault
2	HOT START ABORT SOLENOID CIRCUIT FAULT	StSFlt	Start solenoid V bit fault
		StSIFlt	Start solenoid current fault
3	AUTO/MANUAL CHANGEOVER SOLENOID CIRCUIT FAULT	AMIFlt	Auto/Manual solenoid BIT current fault
		AMSolFlt	Auto/Manual mode solenoid fault
4	OVERSPEED SYSTEM POWER-UP SELF TEST FAULT	OSI12Flt	Overspeed BIT current fault
		OSTst1Flt	Overspeed test 1 failed
		OSTst2Flt	Overspeed test 2 failed
		OSTst3Flt	Overspeed test 3 failed
		OSTst4Flt	Overspeed test 4 failed
		OSTst5Flt	Overspeed test 5 failed
		OSTst6Flt	Overspeed test 6 failed
		OSTst7Flt	Overspeed test 7 failed
5	METERING VALVE POSITION POTENTIOMETER CIRCUIT FAULT	WfmvFlt	Fuel metering valve fault
		WfmvRgFlt	Fuel metering valve range fault
		WfmvRtFlt	Fuel metering valve rate fault
6	POWER LEVER ANGLE (THROTTLE POSITION) POTENTIOMETER CIRCUIT FAULT	PLA12Flt	PLA hard fault
		PLA1Flt	PLA1 potentiometer input fault
		PLA1RgFlt	PLA1 range fault
		PLA2Flt	PLA2 potentiometer input fault
		PLA2RgFlt	PLA2 range fault
		PLADFlt	(PLA1Raw-PLA2Raw) difference fault

Table III. (cont)

Item No.	FADEC fault category	Maintenance terminal fault code	Fault description
6 (cont.)	PLA POTENTIOMETER CIRCUIT FAULT (CONT.)	PLAHdFlt	PLA hard fault
		PLARfFlt	PLA reference voltage fault
		PLARfRgFlt	PLA reference voltage range fault
7	CIT (T1) TEMPERATURE SENSOR CIRCUIT FAULT	T1ABFlt	T1 hard fault
		T1AFlt	T1A fault
		T1ARgFlt	T1A range fault
		T1ARtFlt	T1A rate fault
		T1BFlt	T1B fault
		T1BRgFlt	T1B range fault
		T1BRtFlt	T1B rate fault
		T1DFlt	(T1ARaw-T1BRaw) difference fault
8	Np (N2) SPEED SENSOR CIRCUIT FAULT	Np12Flt	Np hard fault
		Np1CyFlt	Np1 continuity check fault
		Np1Flt	Np1 speed pickup fault
		Np1RgFlt	Np1 range fault
		Np1RtFlt	Np1 rate fault
		Np2CyFlt	Np2 continuity check fault
		Np2Flt	Np2 speed pickup fault
		Np2RgFlt	Np2 range fault
		Np2RtFlt	Np2 rate fault
		NpDFlt	(Np1Raw-Np2Raw) difference fault
9	Ng (N1) SPEED SENSOR CIRCUIT FAULT	Ng12Flt	Ng hard fault
		Ng1CyFlt	Ng1 continuity check fault
		Ng1Flt	Ng1 speed pickup fault
		Ng1RgFlt	Ng1 range fault
		Ng1RtFlt	Ng1 rate fault
		Ng2CyFlt	Ng2 continuity check fault
		Ng2Flt	Ng2 speed pickup fault
		Ng2RgFlt	Ng2 range fault
		Ng2RtFlt	Ng2 rate fault

Table III. (cont)

Item No.	FADEC fault category	Maintenance terminal fault code	Fault description
10	MGT (TGT) THERMOCOUPLE CIRCUIT FAULT	MGTFlt	MGT thermocouple fault
		MGTRgFlt	MGT range fault
		MGTRtFlt	MGT rate fault
11	PERMANENT MAGNET ALTERNATOR (PMA) CIRCUIT FAULT	Al28Flt	Alternator (PMA) fault
12	TORQUE (TMOP OR Q) MEASUREMENT FAULT	QFlt	Torque sensor fault
		QRgFlt	Q range fault
		QRtFlt	Q rate fault
		QVldFlt	In-range torque fault
13	COLLECTIVE PITCH (CP) POTENTIOMETER CIRCUIT FAULT	CPAntFlt	Collective pitch hard fault
		CPFlt	Collective pitch fault
		CPRgFlt	Collective pitch range fault
14	Nr SPEED SENSOR CIRCUIT FAULT	NrAntDsb	Disable rotor decay anticipation
		NrCyFlt	Nr continuity check fault
		NrFlt	Nr fault
		NrRgFlt	Nr range fault
		NrRtFlt	Nr rate fault
15	ECU P1 TRANSDUCER FAULT	P1Flt	P1 pressure sensor fault
		P1HdFlt	P1 hard fault
		P1RgFlt	P1 range fault
		P1RtFlt	P1 rate fault
16	ECU INTERNAL FAULT	AD12BitFlt	12 bit A/D conversion fault
		AD8BitFlt	8 bit A/D conversion fault
		ARINCHWFlt	ARINC hardware fault
		BacCompFlt	Background complete fault
		BVIFlt	Bleed valve solenoid BIT current fault
		CJCFlt	Thermocouple cold junction comp fault
		CJCRgFlt	Thermocouple cold junction comp range fault
		CJCRtFlt	Thermocouple cold junction comp rate fault

Table III. (cont)

Item No.	FADEC fault category	Maintenance terminal fault code	Fault description
16	ECU INTERNAL FAULT (CONT.)	ECUOTFlt	ECU exceeding allowable temperature
(cont.)		EECalFlt	EEPROM calibration data fault
		EEHistFlt	EEPROM engine history data fault
		EEPROMFlt	EEPROM hardware fault
		ForCompFlt	Foreground complete fault
		GainFlt	Gain fault
		GainRgFlt	Gain range fault
		HLRfFlt	High level reference voltage fault
		HLRfRgFlt	High level reference voltage range fault
		IgnFlt	Ignition circuit fault
		OffsFlt	Low level offset fault
		OffsRgFlt	Low level offset range fault
		OrDiodeFlt	"OR" diode fault
		OSVFlt	Overspeed system voltage fault
		OSVRgFlt	OSV voltage range fault
		PROMFlt	PROM hardware fault
		PW10Flt	10 volt pulse width modulator fault
		PW10RgFlt	10 volt pulse width modulator range fault
		RAMFlt	RAM hardware fault
		StrFlt	Starter motor circuit fault
		SWIntFlt	Software interrupt fault
		UARTFlt	UART hardware fault
		UUIntFlt	Unused interrupt fault
		V15Flt	15 volt power supply fault
		V15RgFlt	15 volt power supply range fault
		V5Flt	5 volt power supply fault
		V5RgFlt	5 volt power supply range fault
		WDTFlt	Watchdog timer fault
		WDTOutFlt	Watchdog timer first timeout fault
17	AIRFRAME 28VDC SUPPLY FAULT	AF28Flt	28 volt airframe power fault
		AF28RgFlt	28 volt airframe power range fault

Table III. (cont)

Item No.	FADEC fault category	Maintenance terminal fault code	Fault description
18	OVERSPEED SYSTEM PUSH-TO-TEST SWITCH CIRCUIT FAULT	OSTstSwFlt	Overspeed test switch fault
19	FADEC MODE SWITCH CIRCUIT FAULT	AMSwFlt	Auto/Manual switch fault
20	IGNITION CIRCUIT FAULT	IgnIFlt	Ignition relay fault
21	STEP COUNT FAULT	StepCntFlt	Step count fault
21		WfStFlt	Fuel flow step count fault
21		WfStRgFlt	Fuel flow step count range fault
22	OPEN METERING VALVE INDICATION	OpenMVFlg	Open metering valve warning prior to start
23	OVERSPEED SYSTEM ENGINE SHUTDOWN TEST FAULT	OSTestFlt	Automatic overspeed test fault
24	OVERSPEED SYSTEM Np SPEED SIGNAL FAULT	NpOSFlt	Np overspeed fault
25	WATCHDOG TIMER HARD FAULT	WDTTimeOut	Watchdog timer hard fault
26	UNUSED DISCRETE INPUT FAULT	TestCelFlt	Engine operating in test cell mode
27	INCORRECT MAINTENANCE MESSAGE CODES	ARINCFltAn	NOT VALID FOR THIS INSTALLATION
		CPDFlt	NOT VALID FOR THIS INSTALLATION
		FTempFlt	NOT VALID FOR THIS INSTALLATION
		LoadSelFlt	NOT VALID FOR THIS INSTALLATION
		LoadSHdFlt	NOT VALID FOR THIS INSTALLATION
		NgOFlt	NOT VALID FOR THIS INSTALLATION
		NgORgFlt	NOT VALID FOR THIS INSTALLATION
		NgORtFlt	NOT VALID FOR THIS INSTALLATION
		NrDFlt	NOT VALID FOR THIS INSTALLATION
		P1DFlt	NOT VALID FOR THIS INSTALLATION
28	SECONDARY FAULT CODES	AMFlt	Auto/Manual fault
		HardFlt	ECU hard fault (fail fixed)
		Or28Flt	28V OR'ed power fault
		Or28RgFlt	28V OR'ed power range fault
		OSFlt	Overspeed system functional fault
		TempFlt	MGT temperature fault
		WfHdFlt	Fuel flow hard fault

Table III. (cont)

Item No.	FADEC fault category	Maintenance terminal fault code	Fault description
29	ENGINE LIMITS EXCEEDED	MGTLmTOut	MGT limit exceedence
		MGTRLmTOut	MGT run limit exceedence for 12 or more sec.
		MGTSLmTOut	MGT start limit exceedence
		MGTSRLmTOut	MGT start run limit exceedence for 9 or more sec.
		NgLmTOut	Ng limit exceedence
		NgRLmTOut	Ng run limit exceedence for 10 seconds
		NpLmTOut	Np limit exceedence
		NpQExLmAdv	NpQ exceedence limit advisory indicator
		NpQRnLmAdv	NpQ run limit advisory indicator
		OSFlag	Engine overspeed flag
		QLmTOut	Q limit exceedence
		QRLmTOut	Q run limit exceedence for 10 seconds
30	FUEL FLOW LIMIT EXCEEDED	WfLimFlag	Fuel flow has been limited > 10 seconds
31	ROTOR SPEED TRIM "BEEPER" SWITCH CIRCUIT FAULT	BeepFlt	Cockpit Nr beep fault
32	ROTOR SPEED TRIM "BEEPER" SWITCH STUCK	BpStuckFlt	Beep stuck fault
33	INTERMITTENT FAULT PROCEDURE	Not Applicable	
34	FADEC FAIL WARNING (MFD) INCORRECTLY "ON"	Observed condition	See Fault Category Name
35	FADEC FAIL WARNING (MFD) INCORRECTLY "OFF"	Observed condition	See Fault Category Name
36	FADEC MANUAL WARNING (MFD) INCORRECTLY "ON"	Observed condition	See Fault Category Name
37	FADEC MANUAL WARNING (MFD) INCORRECTLY "OFF"	Observed condition	See Fault Category Name
38	Ng (N1) COCKPIT GAUGE INOPERATIVE OR ERRATIC	Observed condition	See Fault Category Name

Table III. (cont)

Item No.	FADEC fault category	Maintenance terminal fault code	Fault description
39	Np (N2) COCKPIT GAUGE INOPERATIVE OR ERRATIC	Observed condition	See Fault Category Name
40	OVERSPEED TEST FAILS TO OPERATE	Observed condition	See Fault Category Name
41	ENGINE OUT WARNING (MFD) INCORRECTLY "ON"	Observed condition	See Fault Category Name
42	ENGINE OUT WARNING (MFD) INCORRECTLY "OFF"	Observed condition	See Fault Category Name
43	FADEC MAINT. ADVISORY (MFD) INCORRECTLY "ON"	Observed condition	See Fault Category Name
44	FADEC MAINT. ADVISORY (MFD) INCORRECTLY "OFF"	Observed condition	See Fault Category Name
45	FADEC FAILS FIXED WITH NO MFD FADEC FAIL WARNING	Observed condition	See Fault Category Name
46	MANUAL MODE OPERATIONAL PROBLEM	Observed condition	See Fault Category Name
47	MAINTENANCE TERMINAL COMMUNICATION FAULT	Observed condition	See Fault Category Name
48	FADEC DEGRADE - DROOP MESSAGE (MFD) INCORRECTLY "ON"	Observed condition	See Fault Category Name
49	FADEC DEGRADE - DROOP MESSAGE (MFD) INCORRECTLY "OFF"	Observed condition	See Fault Category Name
50	FADEC DEGRADE - OS (OVERSPEED) MESSAGE (MFD) INCORRECTLY "ON"	Observed condition	See Fault Category Name
51	FADEC DEGRADE - OS (OVERSPEED) MESSAGE (MFD) INCORRECTLY "OFF"	Observed condition	See Fault Category Name
52	FADEC DEGRADE - ARINC MESSAGE (MFD) INCORRECTLY "ON"	Observed condition	See Fault Category Name
53	FADEC DEGRADE - ARINC MESSAGE (MFD) INCORRECTLY "OFF"	Observed condition	See Fault Category Name
54	FADEC DEGRADE - TRQ LIM LOSS MESSAGE (MFD) INCORRECTLY "ON"	Observed condition	See Fault Category Name
55	FADEC DEGRADE - TRQ LIM LOSS MESSAGE (MFD) INCORRECTLY "OFF"	Observed condition	See Fault Category Name
56	FADEC DEGRADE - TGT (OR MGT) LIM LOSS MESSAGE (MFD) INCORRECTLY "ON"	Observed condition	See Fault Category Name
57	FADEC DEGRADE - TGT (OR MGT) LIM LOSS MESSAGE (MFD) INCORRECTLY "ON"	Observed condition	See Fault Category Name

The fault isolation/correction procedures were structured to follow a logic that, after listing the symptom and possible causes, specified an initial inspection, measurement, or test, the results of which could be answered *yes* or *no*. The subsequent step branched from the *yes-no* decision to another inspection, measurement, or test, to the next *yes-no* decision point, and onward until the fault was isolated and corrected. At each step where an inspection, measurement, or test was specified, the corresponding detailed task or procedure from the applicable Technical Manual was referenced. Where no relevant manual (or manual update) was available, such as the airframe manual associated with the 250-C30R/3 engine, similar sections of the T703-AD-700 powered airframe manual (TM55-1520-248-23) were referenced with the notation "*similar to. . . .*"

6.2 Visio Flow Charts of Troubleshooting/Diagnostic Procedures

The troubleshooting/diagnostic procedures were arranged in flow chart format, using Visio software, and are presented as follows:

	Category	Appendix
6.2.1	T703-AD-700 engine	A
6.2.2	250-C30R/3 basic engine	B
6.2.3	250-C30R/3 FADEC	C

Although the creation of the Visio charts is an interim step in the execution of this ATEDS contract, note that even in the graphic format they provide a more systematic approach to fault isolation and correction than has heretofore been available to the mechanic, and thus may be useful in maintaining the OH-58D fleet until ATEDS is implemented.

6.3 Standard Generalized Markup Language (SGML) Tagged Data

The text and logic from Visio charts of the troubleshooting/diagnostic procedures were used directly as inputs to the SGML tagging. SGML tagged data, while the final product of this contract, is not the final step in creating the envisioned Aviation Turbine Engine Diagnostic System. The tagged data must be processed with other software to provide the meaningful portable computer input/output a mechanic would use to maintain the engine.

Appendix D contains a printout of a sample SGML-tagged data file, based on one of the simpler fault correction procedures (250-C30R/3 basic engine procedure R-6—*Gas Generator Idle Speed Too High or Too Low*)—to provide a general view of the structure of the language. A complete set of the tagged data files, for all 159 procedures, has already been provided to the Army on CD-ROM and is not included herein.

A brief description of the SGML tagging process, as well as identification of the additional software required to provide a useable system, is also included in Appendix D.

6.4 Specialized Test Equipment Required to Support Troubleshooting and Diagnosing

Specialized test equipment required to implement troubleshooting of engine and engine-to-aircraft interface faults is presented in Appendix E. Six items were identified. A list, relating specific equipment to the various troubleshooting procedures, is also included. A variety of equipment required to perform common maintenance and repair functions, such as special lifting and handling fixtures, wrenches, lip seal pullers, vibration measuring systems, etc., is already in the Army inventory and thus currently available.

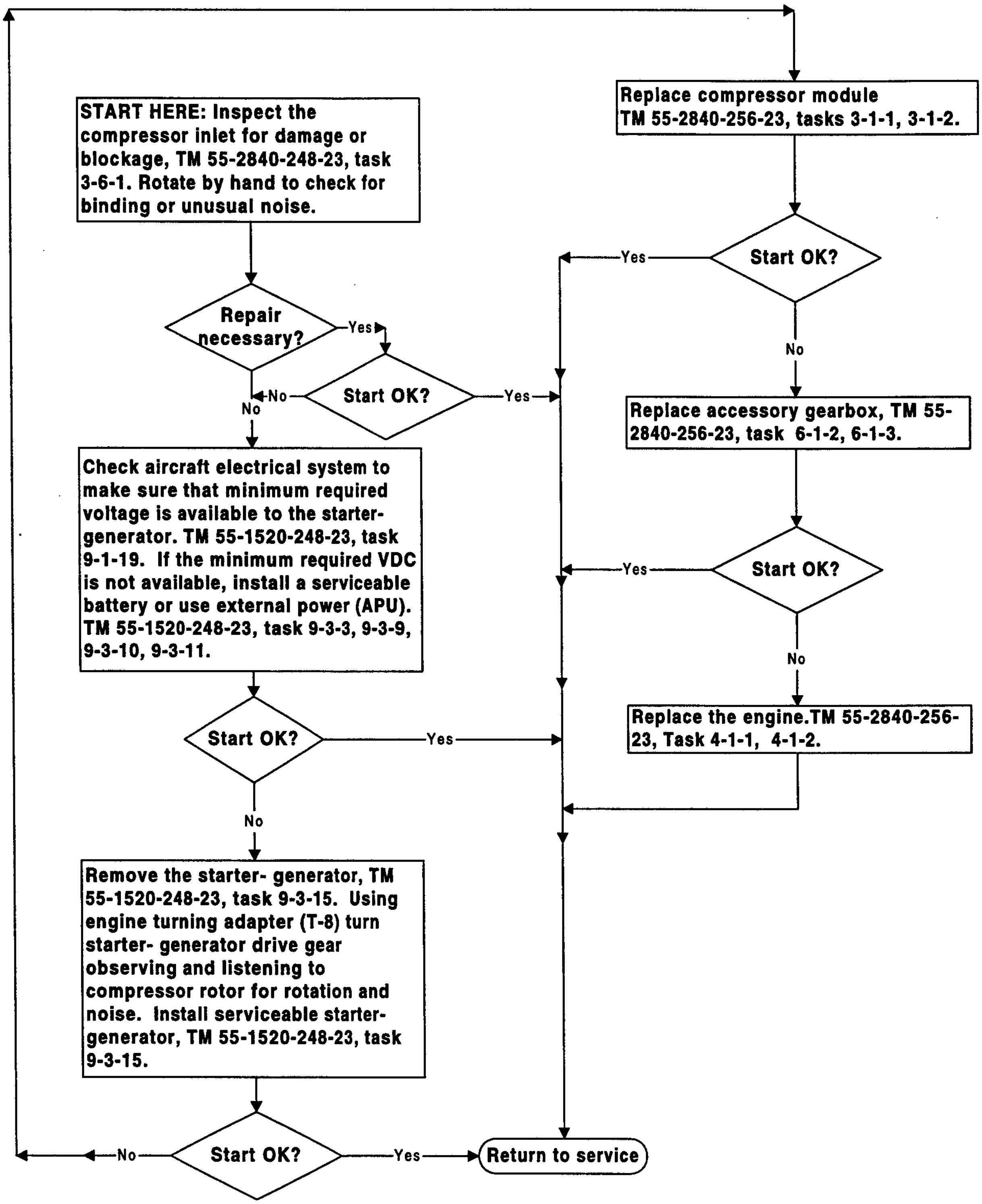
Appendix A

T703-AD-700 Fault Isolation and Correction Visio Charts

51 Procedures (63 pages)

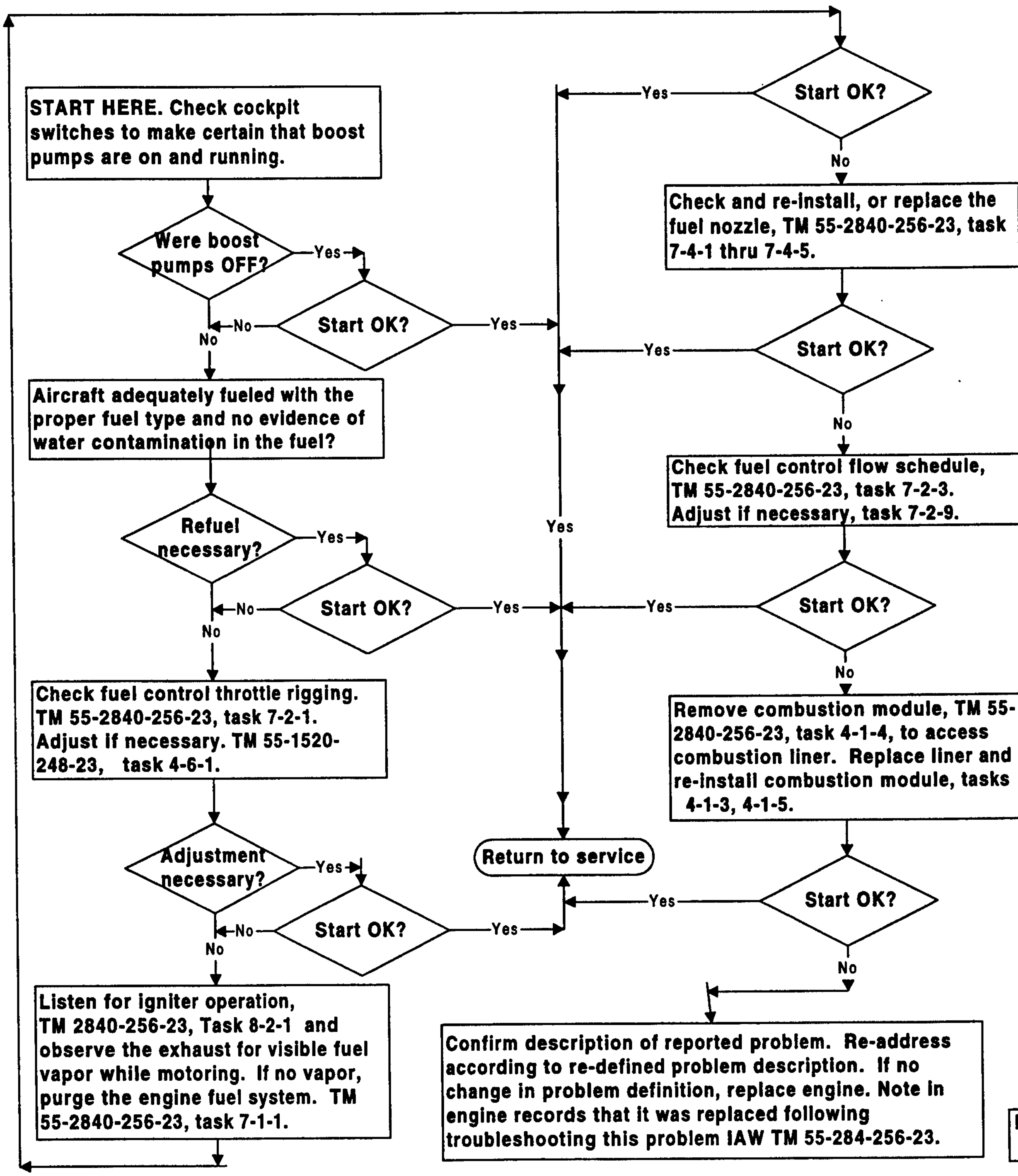
ST-1 STARTER UNABLE TO MOTOR ENGINE TO FUEL INTRODUCTION SPEED (12 - 15% Ng). Page 1 of 1

THIS MAY BE CAUSED BY: Low battery Inefficient starter. GGT rotor or turbine rub or drag. Inlet blockage or exhaust blockage or damage.



Page 1 of 63

THIS MAY BE THE RESULT OF: Fuel control throttle in cut off. Air in the fuel control or lines. Empty fuel tank. Insufficient fuel to the fuel pump. Fuel pump inoperative. Vapor or other contaminant in the fuel. Improperly shimmed fuel nozzle. Fuel nozzzle flow divider valve stuck closed. Fuel nozzle coking. Faulty circuit to the ignition unit. Faulty ignition exciter or spark igniter. Combustion liner. Outer combustion case. GGT 1st stage nozzle shield.



Page 2 of 63

ST-3 ENGINE LIGHTS OFF PRIOR TO REACHING FUEL INTRODUCTION SPEED. (PREMATURE LIGHT OFF). Page 1 of 1

THIS MAY BE CAUSED BY: Fuel control cut off valve leaking or not closed during initial crank. Combuster drain valve stuck closed.

NOTE: If light-off occurs at a very low cranking speed, a hot start will usually result unless fuel flow to the engine is immediately shut off by either throttle closure or by fuel shut valve closure if the fuel control cutoff valve is leaking.

START HERE: Inspect the fuel control throttle linkage and cut off valve to make certain that the throttle lever is against its minimum stop and cutoff valve is seated, TM 55-2840-256-23, tasks 7-2-1, 7-2-6.

Repair necessary? — Yes / No

Inspect the combuster drain valve for proper function, and that its drain line is not blocked. TM 55-2840-256-23, task 4-5-1 thru 4-5-3.

Start OK? — Yes → Return to service / No

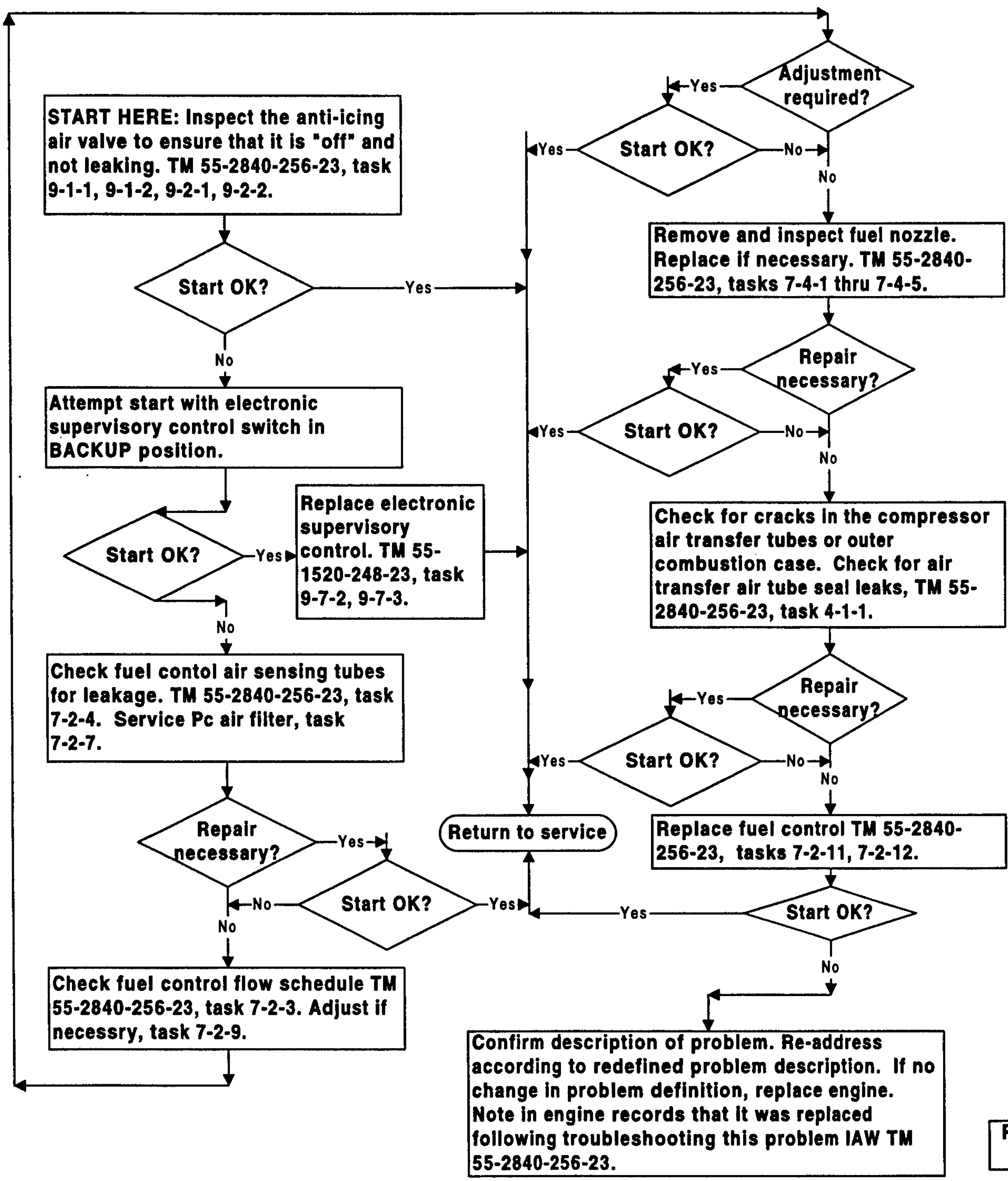
Replace the fuel control TM 55-2840-256-23, tasks 7-2-11, 7-2-12.

Start OK? — Yes → Return to service / No

Confirm description of problem. Re-address according to re-defined problem description. If no change in problem definition, replace engine. Note in engine records that it was replaced following troubleshooting this problem IAW TM 55-2840-256-23.

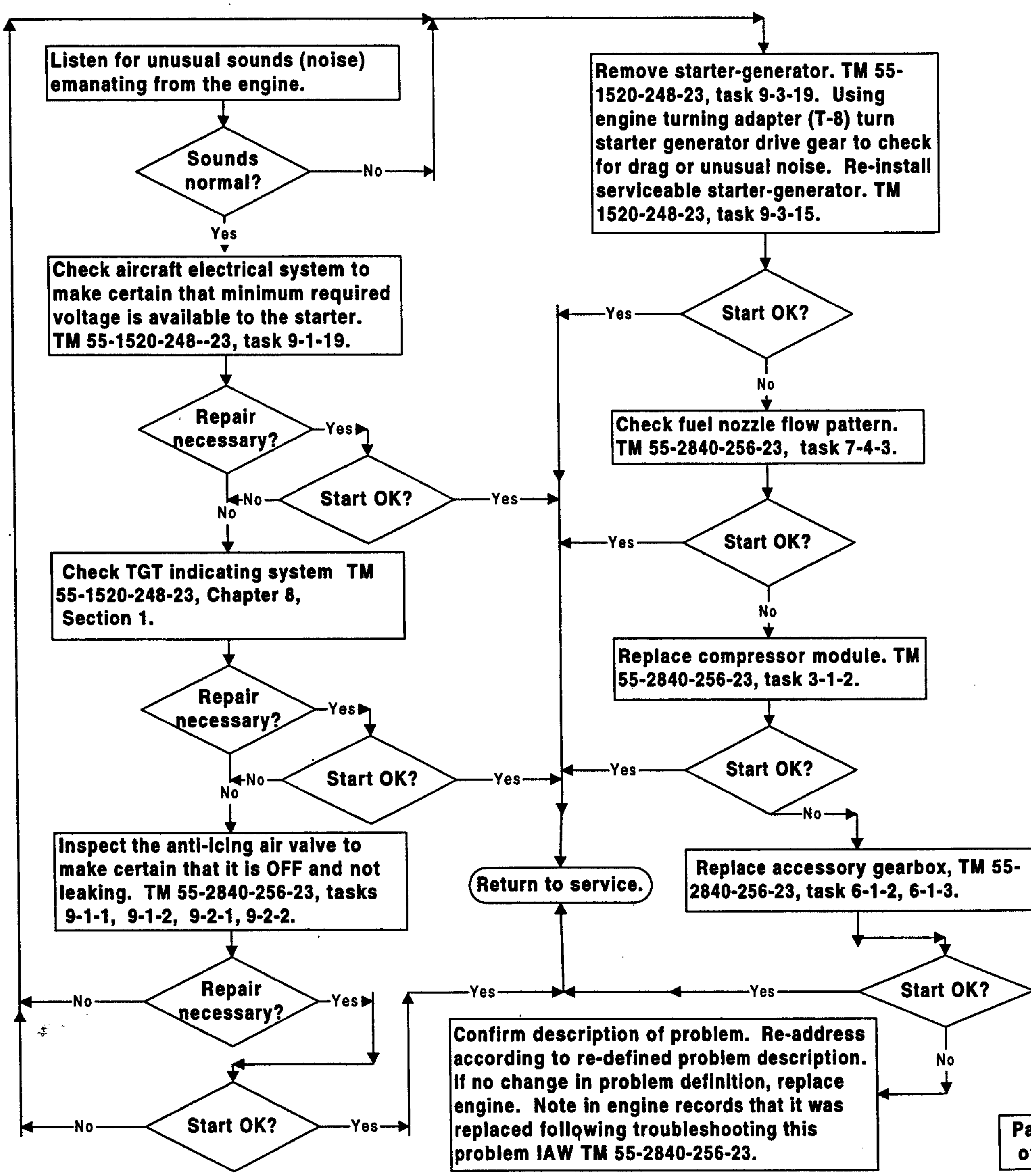
ST-4 ENGINE LIGHTS OFF BUT ACCELERATION RATE IS SLOW WITH LOW TGT (APPROX. 550 Degrees C.) MAY STAGNATE (HANG) AROUND 30% Ng.

THIS MAY BE CAUSED BY: Restricted fuel supply. Low fuel pressure at pump inlet. Anti-icing air or accessory bleed air on. Pneumatic leak in the fuel control Pc supply system. Fuel nozzle carbon. Compressor damage or erosion. Excessive compressor air leakage. Fuel control malfunction. Electronic supervisory control.

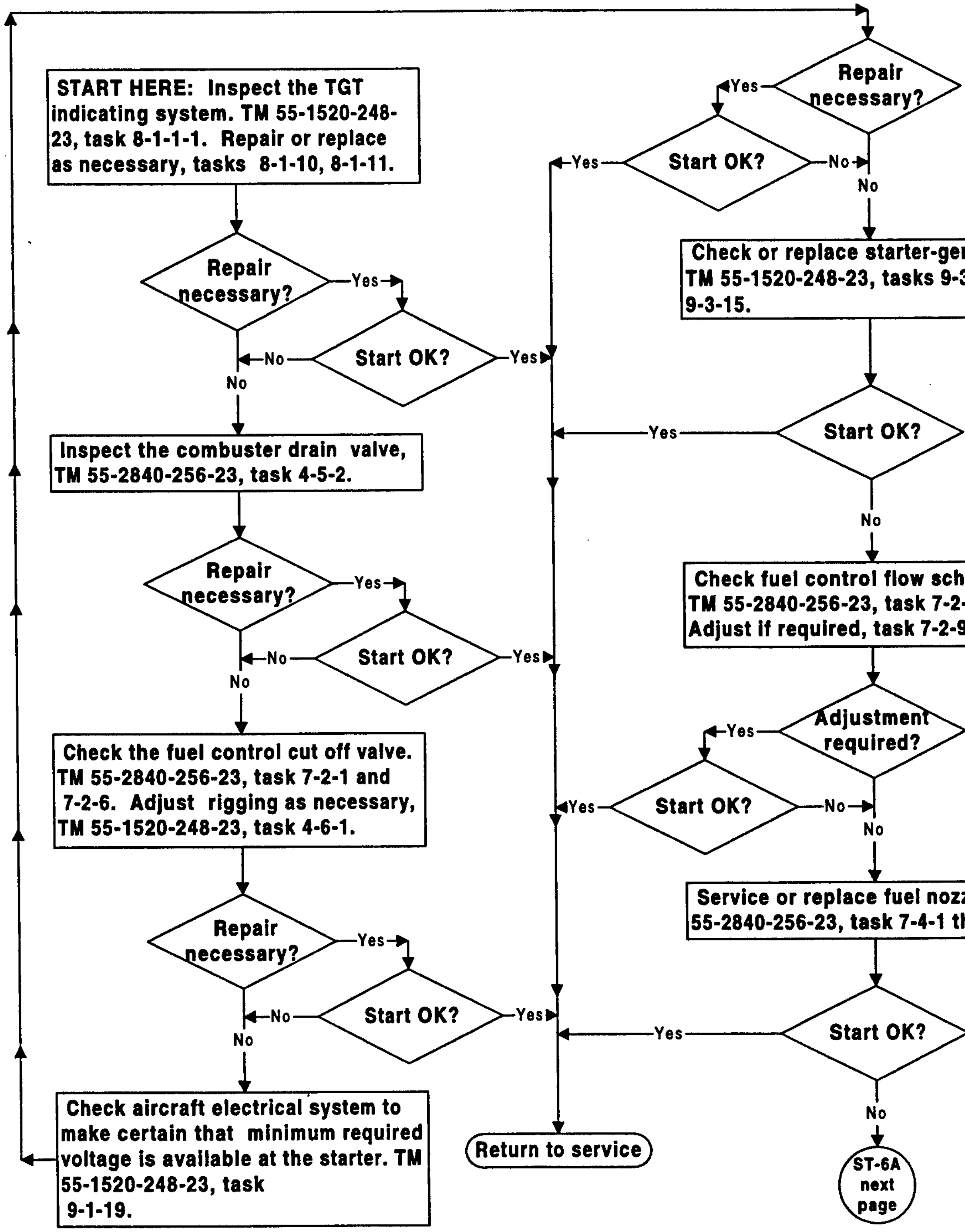


ST-5 ENGINE LIGHTS OFF BUT ACCELERATION RATE IS SLOW WITH HIGHER THAN NORMAL TGT. Page 1 of 1

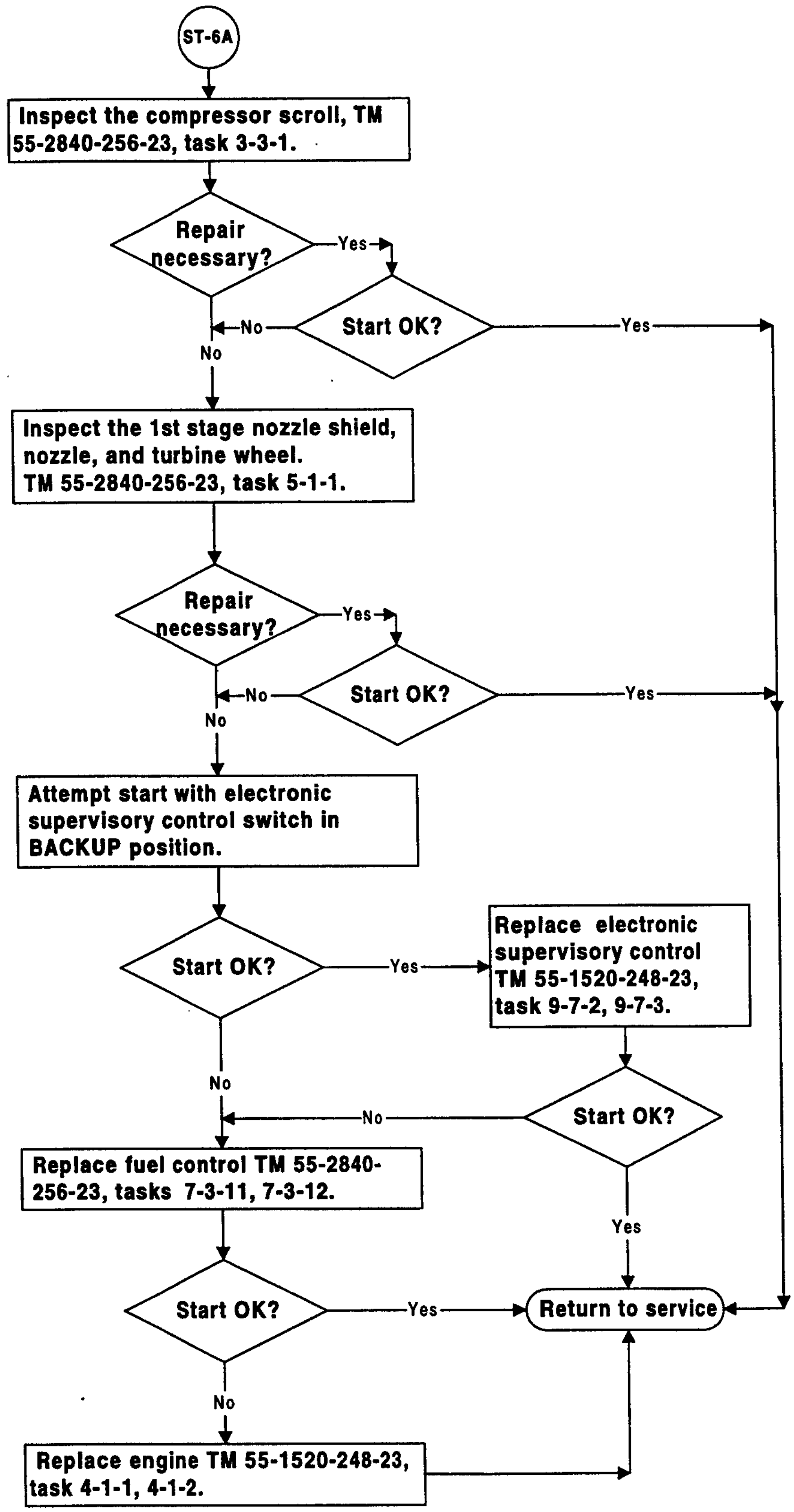
THIS MAY BE CAUSED BY: TGT indicating system error. Low battery. Degraded starter. Anti-icing air valve open or cabin heat on. Compressor bleed valve stuck closed (T703-AD-700 engine only). Fuel nozzle valve stuck open. Degraded compressor. Degraded turbine. Aircraft electrical system. Excessive gearbox load.



THIS MAY BE CAUSED BY: TGT indicating system error. Residual fuel in the combustor. High residual TGT. Insufficient starter torque. Low battery. Fuel nozzle flow divider valve stuck. Excessive compressor bleed air leakage. Fuel control flow schedule shift. Electronic supervisory control.

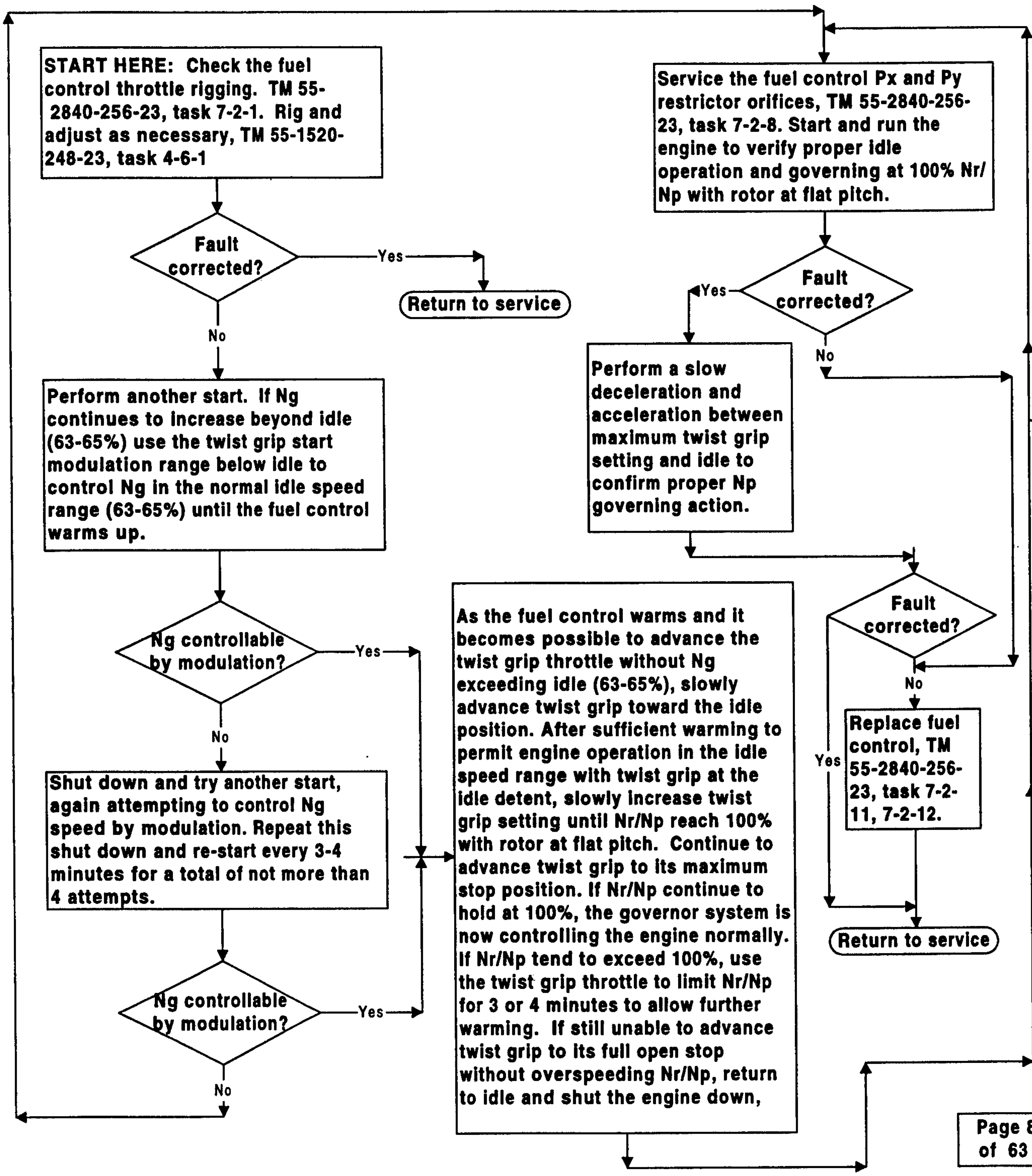


ST-6. Page 2 of 2



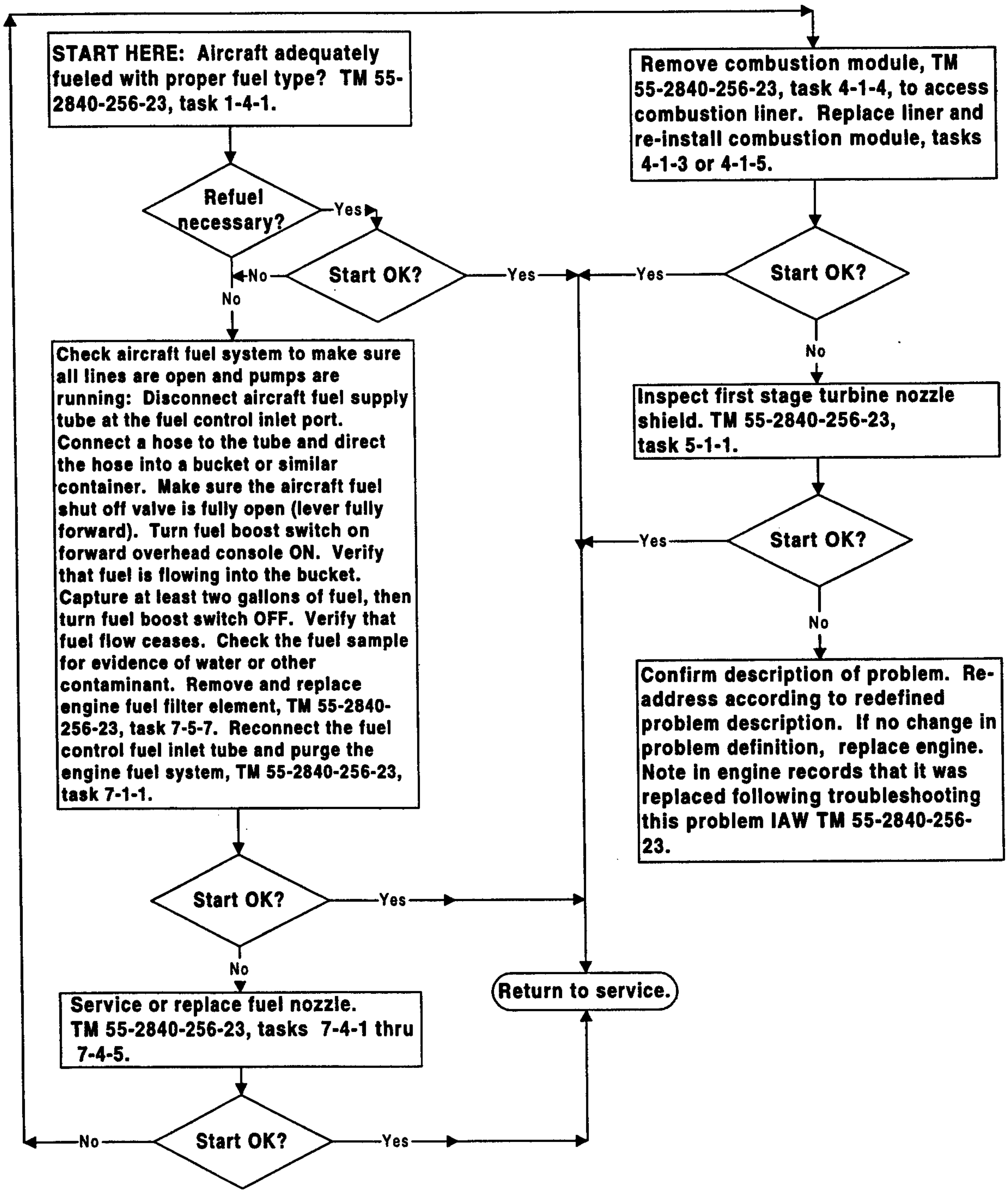
ST-7 ENGINE ACCELERATES TO OVERSPEED DURING START.

THIS MAY BE CAUSED BY: Fuel control throttle rigging. Frosting or icing of the Py governing orifice in the fuel control. Fuel control failure.



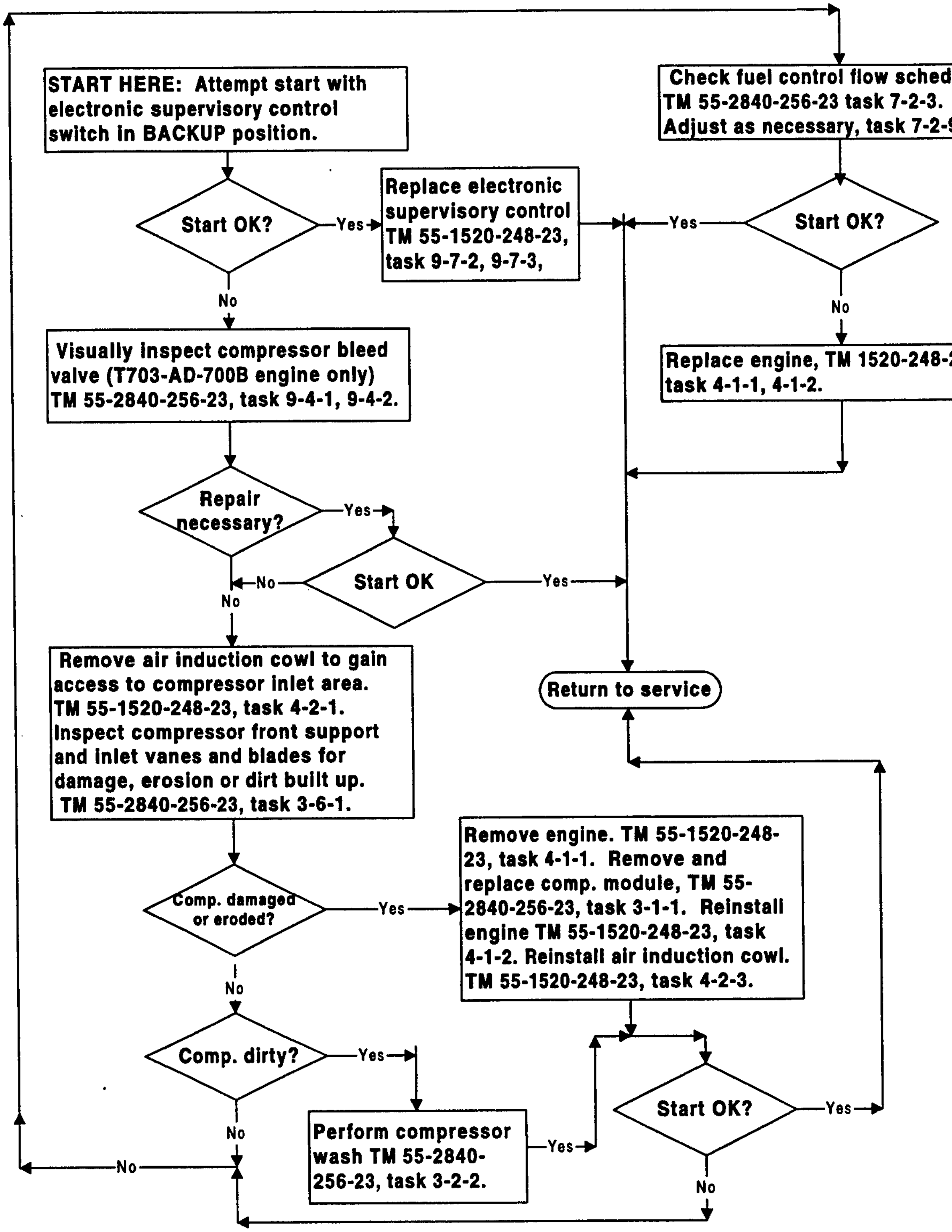
ST-8 ENGINE LIGHTS OFF BUT FLAMES OUT DURING GROUND STARTS AT HIGH ALTITUDE, ESPECIALLY ABOVE 5000 FT. (1824 METERS) AT COOL TEMPERATURES.

THIS MAY BE CAUSED BY: Using incorrect fuel type. Fuel nozzle coking. Combustor. Outer combustion case. GGt 1st stage nozzle shield.



ST-9 COMPRESSOR SURGE DURING STARTING. Page 1 of 1

THIS MAY BE CAUSED BY: Foreign object damage. Compressor erosion. Fuel control schedule shifted high. Compressor bleed valve stuck closed (T703-AD-700B engine only). Electronic supervisory control.



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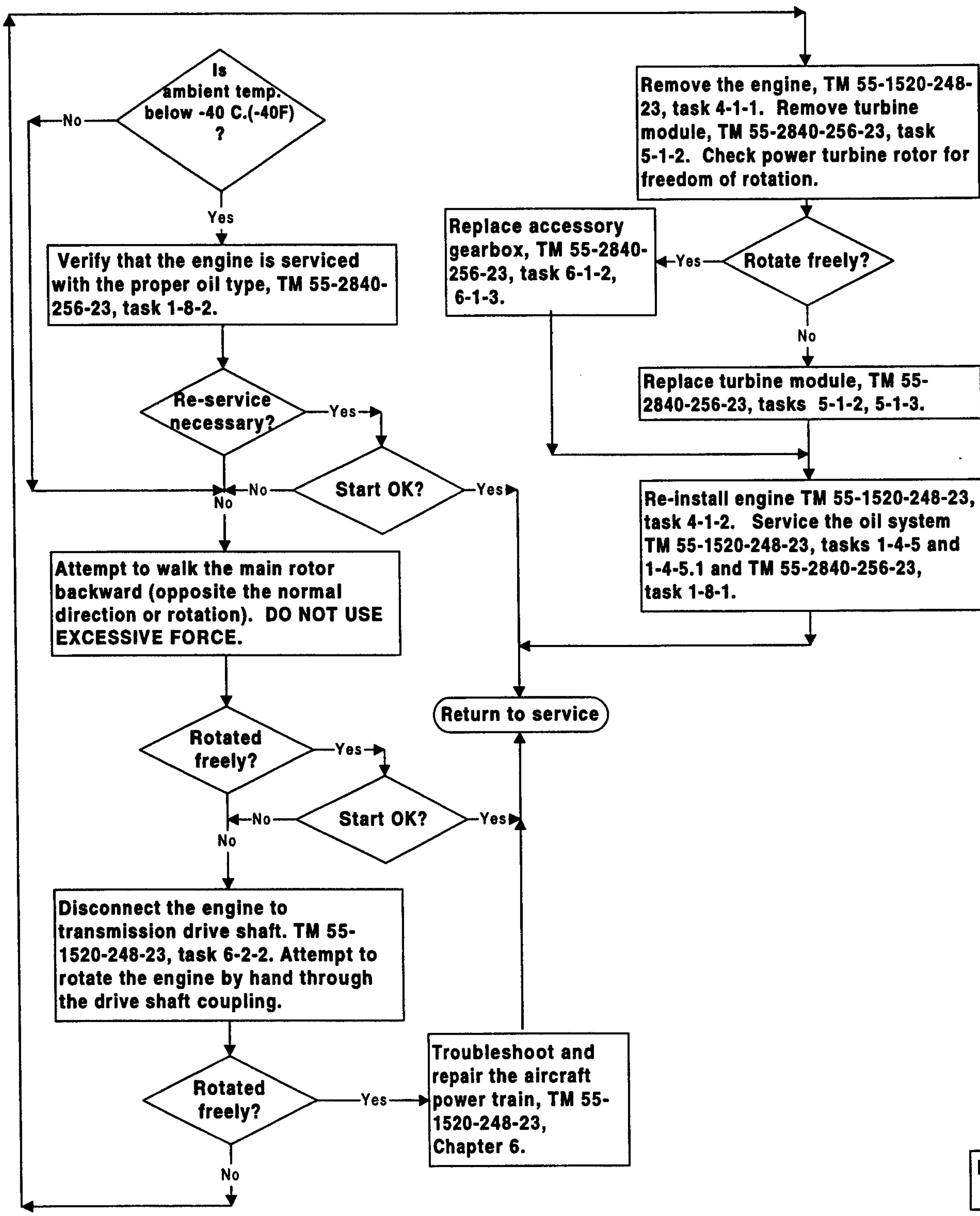
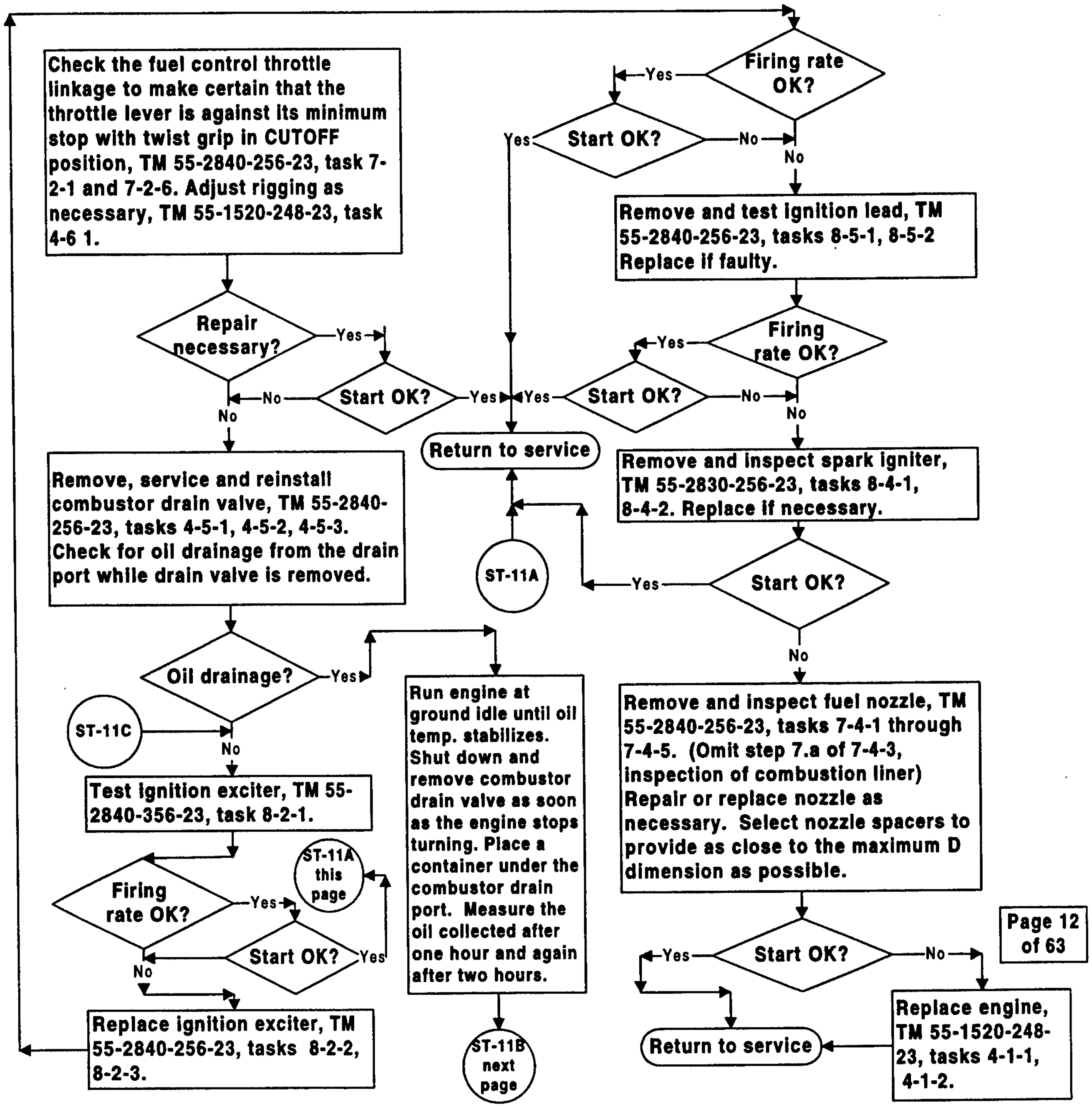
ST-10 MAIN ROTOR AND Np DO NOT ROTATE BY 25% Ng DURING START.

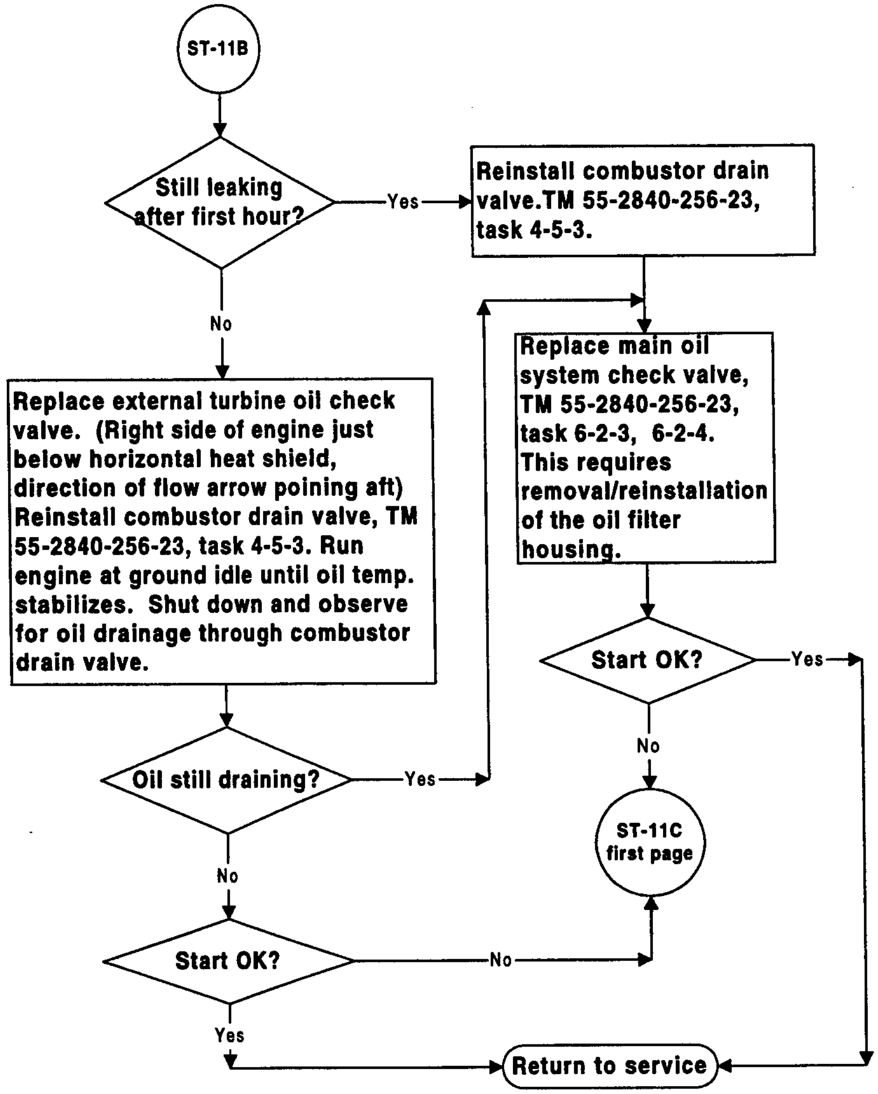
THIS MAY BE CAUSED BY: Improper oil type in cold weather. Excessive drag in aircraft power train. Accessory gearbox internal fault. Turbine wheel rub.



ST-11 RICH, DELAYED LIGHT OFF. Page 1 of 2

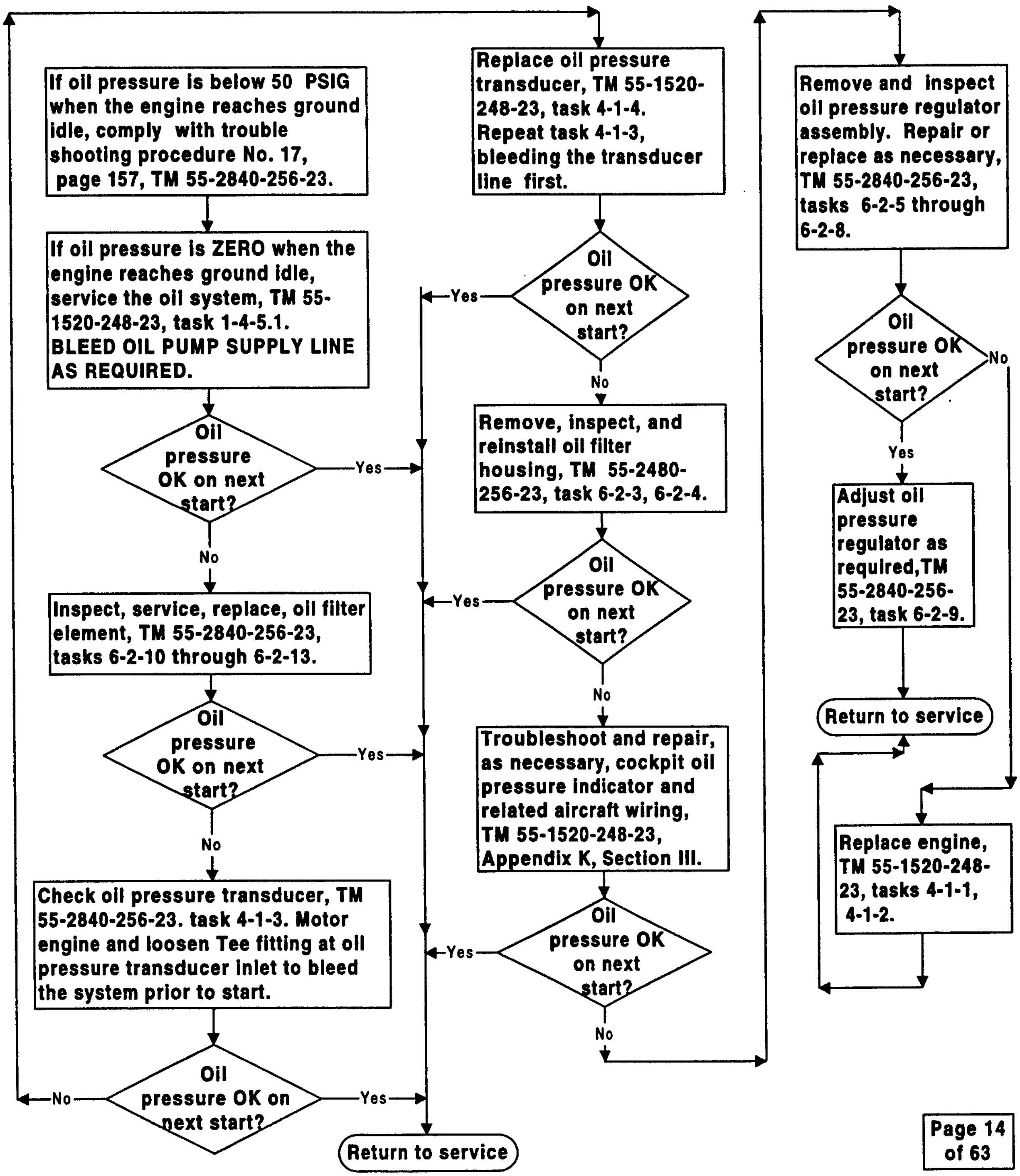
THIS PROBLEM IS CHARACTERIZED BY: A somewhat sharp "WOOF" sound, frequently accompanied by a brief torching from the engine exhaust. Possible causes are: Fuel control cut off valve not fully closed, or leaking. Faulty ignition exciter, lead, or spark igniter. Faulty combustor drain valve. Faulty check valve in engine oil system. Fuel nozzle spray pattern or flow divider. Fuel nozzle shimming.




ST-11B
Still leaking after first hour?
Yes
Reinstall combustor drain valve.TM 55-2840-256-23, task 4-5-3.
No
Replace external turbine oil check valve. (Right side of engine just below horizontal heat shield, direction of flow arrow poining aft) Reinstall combustor drain valve, TM 55-2840-256-23, task 4-5-3. Run engine at ground idle until oil temp. stabilizes. Shut down and observe for oil drainage through combustor drain valve.
Replace main oil system check valve, TM 55-2840-256-23, task 6-2-3, 6-2-4. This requires removal/reinstallation of the oil filter housing.
Start OK?
Yes
No
ST-11C first page
Oil still draining?
Yes
No
Start OK?
No
Yes
Return to service

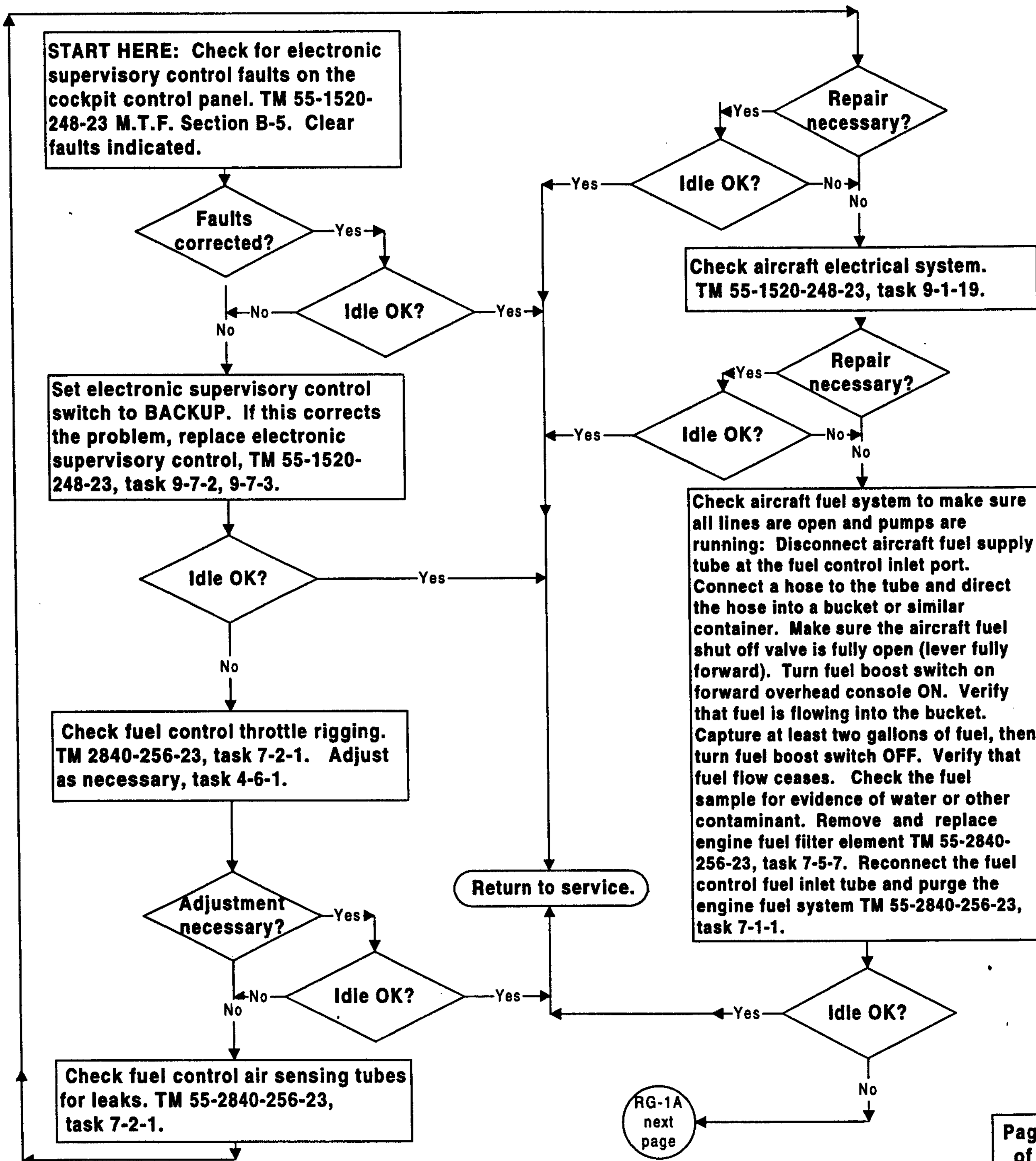
ST-12. NO OIL PRESSURE INDICATION DURING START.

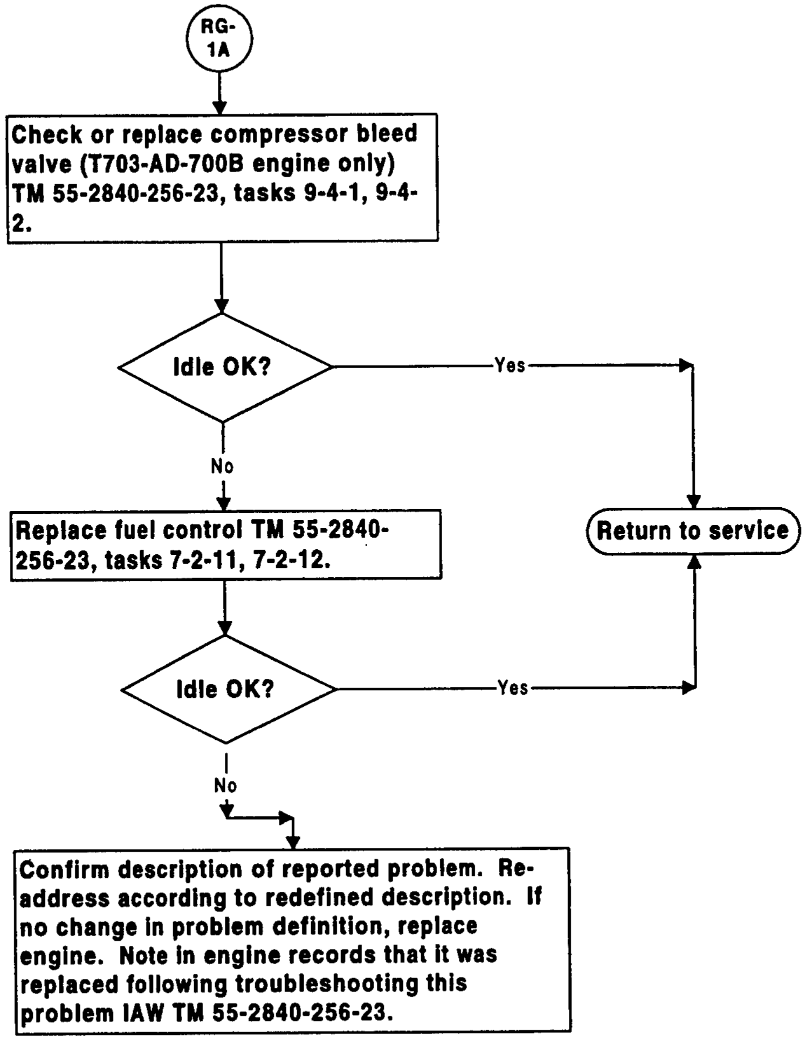
THIS MAY BE CAUSED BY: Main oil pump not properly primed. Restriction in oil pump supply line. Low oil level in tank. Dirty oil filter. Faulty aircraft oil pressure sensor or indicator. Leaks within the oil filter housing. Oil pressure regulator sticking. Oil pump or oil pump drive failure. Accessory gearbox problem.



RG-1 ENGINE SPEED CYCLES (UNSTABLE) AT GROUND IDLE (61-63% Ng).

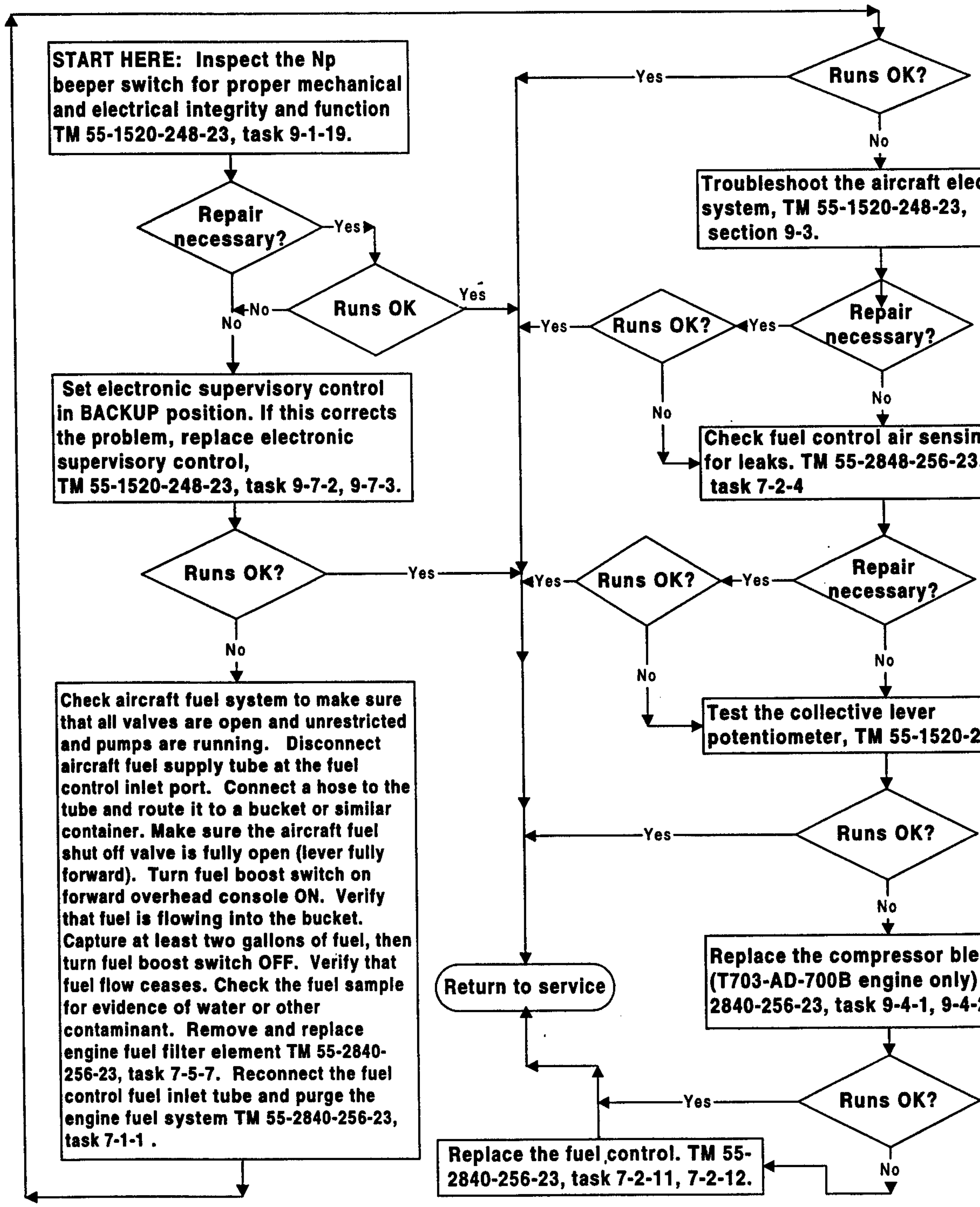
THIS MAY BE CAUSED BY: Fuel control throttle rigging or security. Restriction in fuel supply. Fuel control sensing air tube leak. Fuel control malfunction. Aircraft electrical harness. Electronic supervisory control. Compressor bleed valve (T703-AD-700B engine only).




RG-1A
Check or replace compressor bleed valve (T703-AD-700B engine only) TM 55-2840-256-23, tasks 9-4-1, 9-4-2.
Idle OK?
Yes
No
Replace fuel control TM 55-2840-256-23, tasks 7-2-11, 7-2-12.
Return to service
Idle OK?
Yes
No
Confirm description of reported problem. Re-address according to redefined description. If no change in problem definition, replace engine. Note in engine records that it was replaced following troubleshooting this problem IAW TM 55-2840-256-23.

RG-2. IDLE SPEED CYCLES (UNSTABLE) AT 100% Nr/Np, MAIN ROTOR AT FLAT PITCH (FLIGHT IDLE). Page 1 of 1

THIS MAY BE CAUSED BY: Np beeper switch. Collective pitch position potentiometer. Fuel control throttle rigging or security. Restriction in fuel supply. Aircraft electrical system. Fuel control air sensing tube leaks. Fuel control malfunction. Compressor bleed valve control (T703-AD-700B engine only). Electronic supervisory control.



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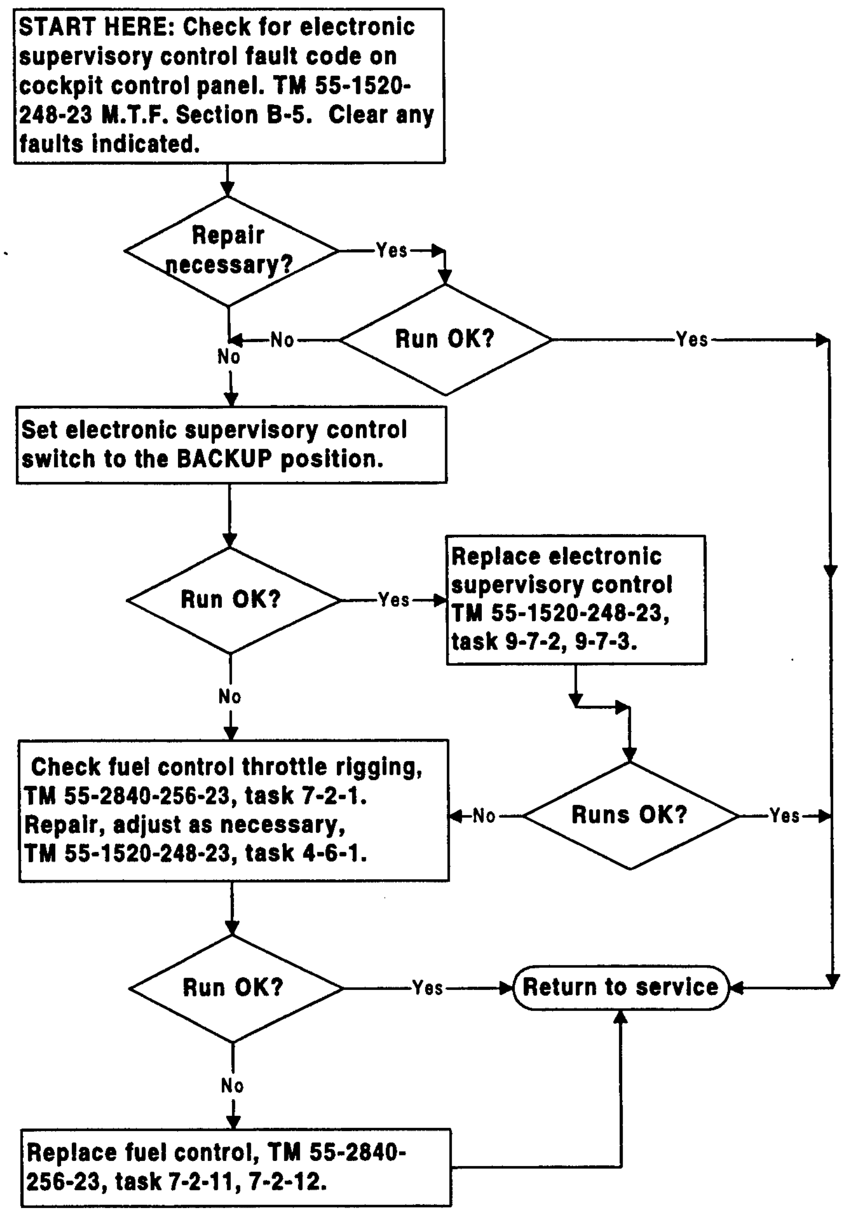
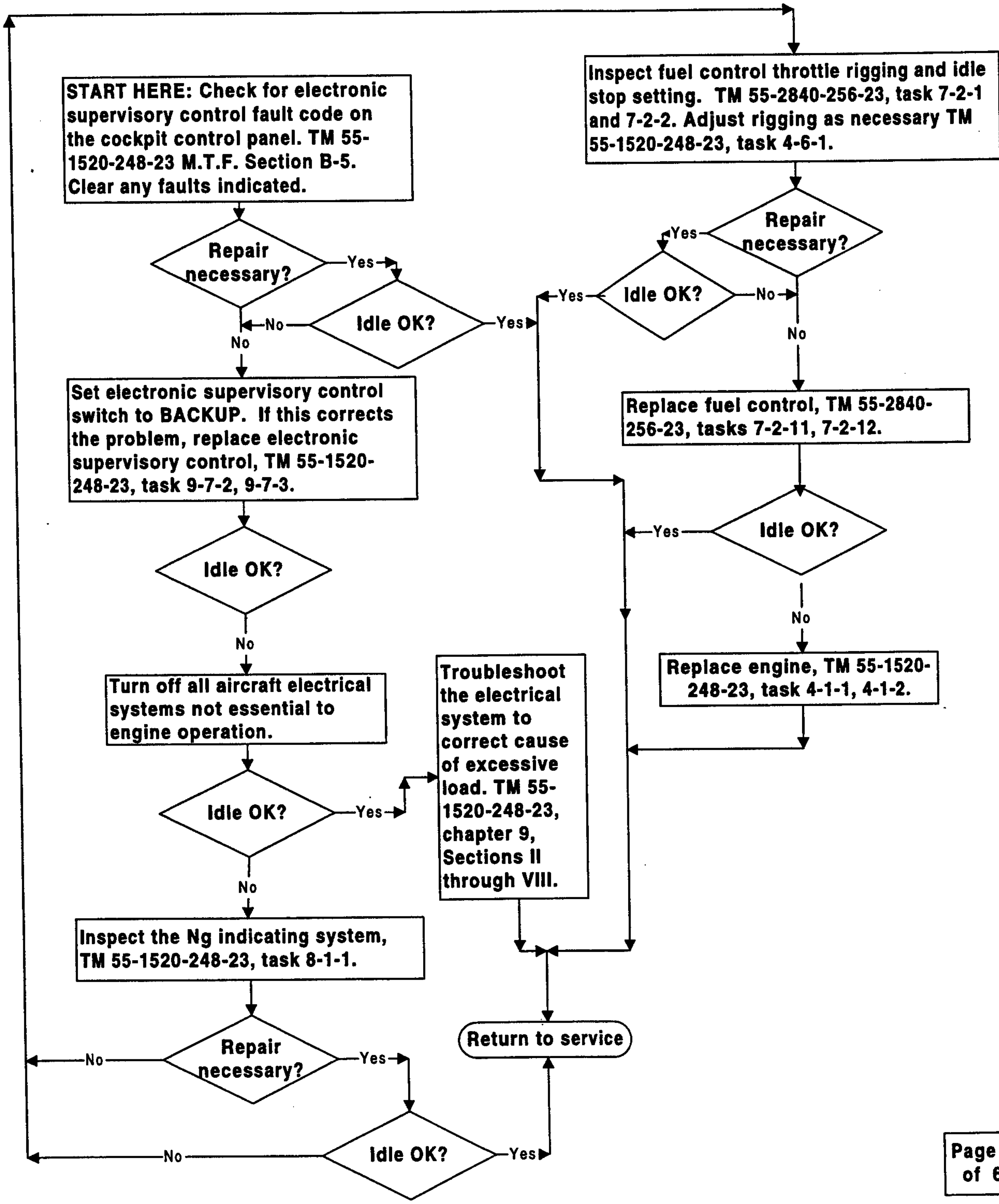
RG-3 IDLE SPEED DOES NOT REPEAT TO THE DESIRED SET POINT ON REPEATED THROTTLE MOVEMENTS FROM, AND RETURNING TO, IDLE.

THIS MAY BE CAUSED BY: Fuel control throttle rigging or security. Fuel control malfunction. Electronic supervisory control.



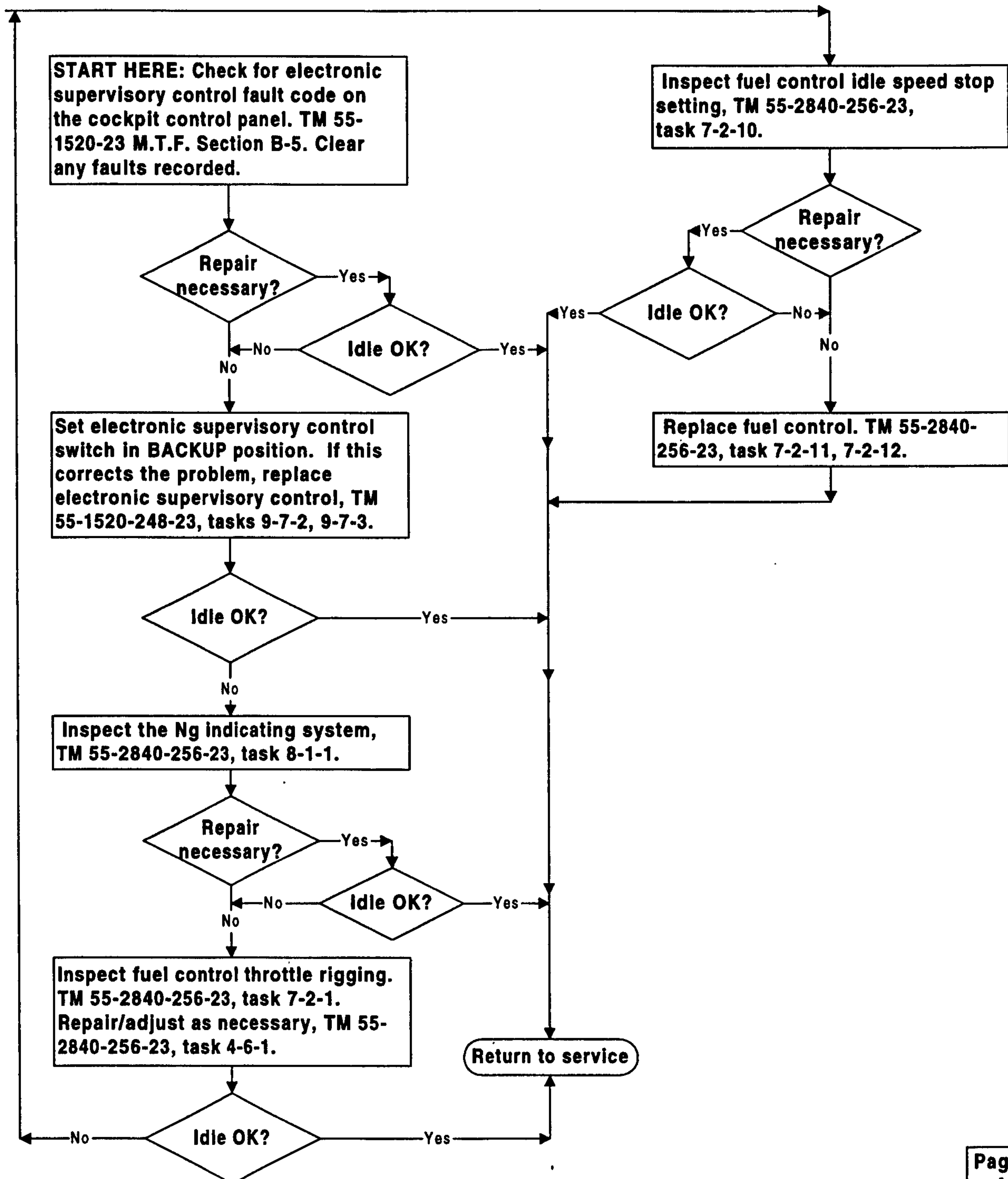
RG-4 IDLE SPEED TOO LOW (SHIFTED LOW FROM PRIOR SETTING).

THIS MAY BE CAUSED BY: Fuel control throttle rigging. Idle speed adjustment improperly set. Ng tachometer error. Excessive gererator load (will result in slightly higher TGT). Fuel control malfunction. Electronic supervisory control.



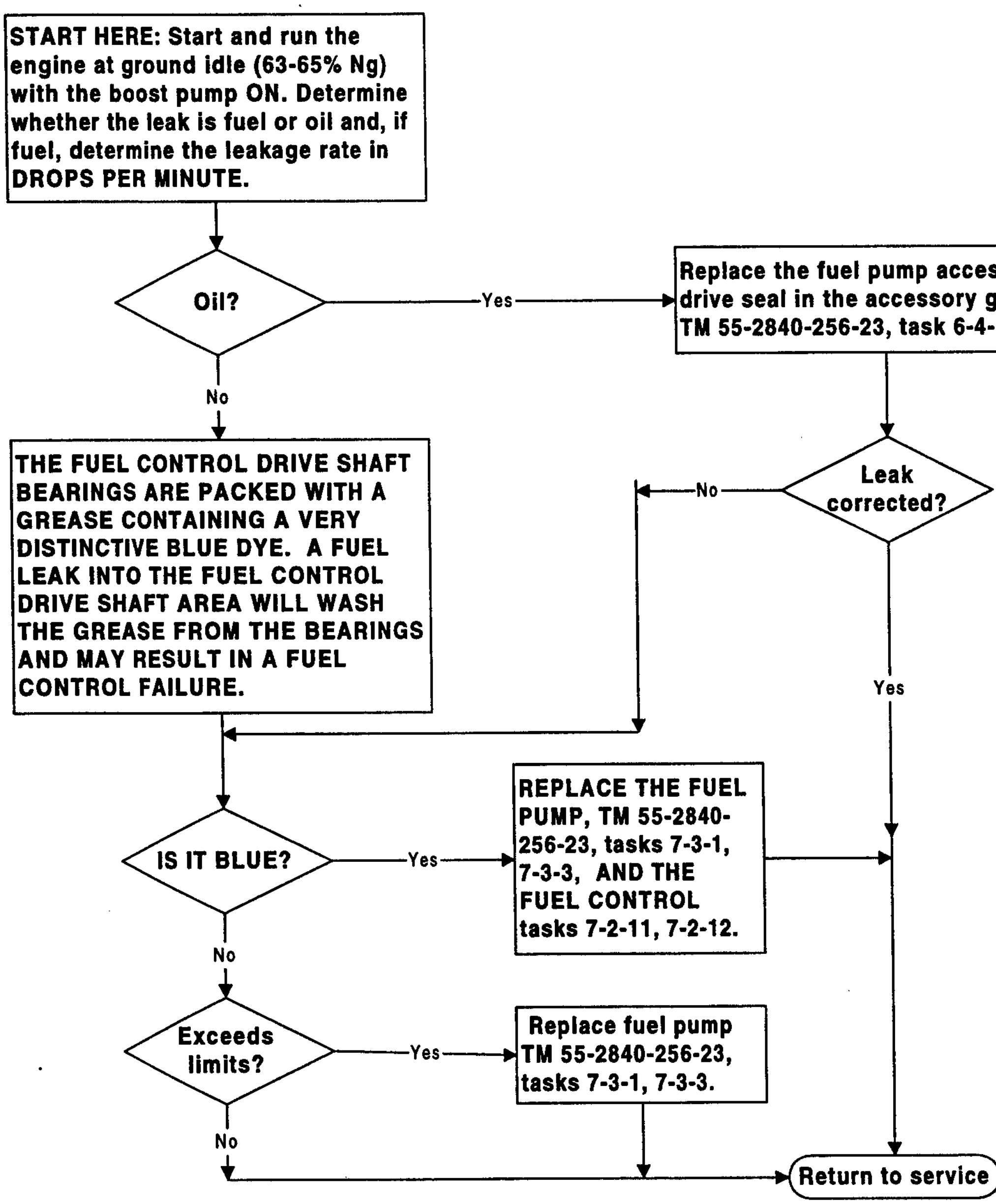
RG-5 IDLE SPEED TOO HIGH. WILL NOT RESPOND TO IDLE SPEED DECREASE ADJUSTMENT. MAY RESPOND TO GROSS IDLE SPEED INCREASE ADJUSTMENT.

THIS MAY BE CAUSED BY: Ng tachometer error. Incorrect fuel control throttle rigging. Incorrect idle speed stetting. Fuel control malfunction. Electronic supervisory control.



RG-6. FUEL AND/OR OIL LEAKING FROM FUEL PUMP/FUEL CONTROL OVERBOARD DRAIN PORTS.

FUEL LEAKAGE FROM THE FUEL CONTROL SEAL DRAIN IS PERMISSIBLE UP TO TEN DROPS PER MINUTE. EXCESSIVE FUEL LEAKAGE IS CAUSED BY A FAULTY FUEL PUMP TO FUEL CONTROL DRIVE SHAFT SEAL. OIL LEAKAGE IS CAUSED BY A FAULTY GEARBOX TO FUEL PUMP SEAL. THE FUEL CONTROL DRAIN (FUEL) AND THE FUEL PUMP DRAIN (OIL) ARE BOTH CONNECTED TO THIS COMMON DRAIN PORT.



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RG-7. OIL EMANATING FROM THE DIFFUSER VENT ORIFICE. Page 1 of 1

This is usually caused by an improperly sized vent orifice. However a leaking breather gearshaft lip seal can also be the cause.

The compressor diffuser vent system consists of a two piece flanged tube, with a slip joint, which connects between the compressor diffuser and the exhaust collector. A size selected orifice is located at the exhaust collector end and controls vent system pressure. If vent pressure is too low, oil can leak past the compressor rear inner labyrinth seal or past the No. 5 labyrinth seal and into the exhaust collector. If vent pressure is too high it will cause oil to be blown overboard through the AGB breather vent. OIL SPEWING OR SEEPING FROM THE DIFFUSER VENT ORIFICE OR TUBING JOINTS INDICATES THAT VENT PRESSURE MAY BE TOO HIGH.

Inspect the vent orifice and replace or re-size as necessary. TM 55-2840-256-23, task 3-5-1, 3-5-2. VENT PRESSURE MUST BE AT LEAST 0.8 IN. Hg AT GROUND IDLE AND NOT MORE THAN 10.0 IN. Hg AT TAKEOFF POWER. Replace vent orifice with progressively smaller sizes until vent pressure is near its lowest limit.

Fault corrected?

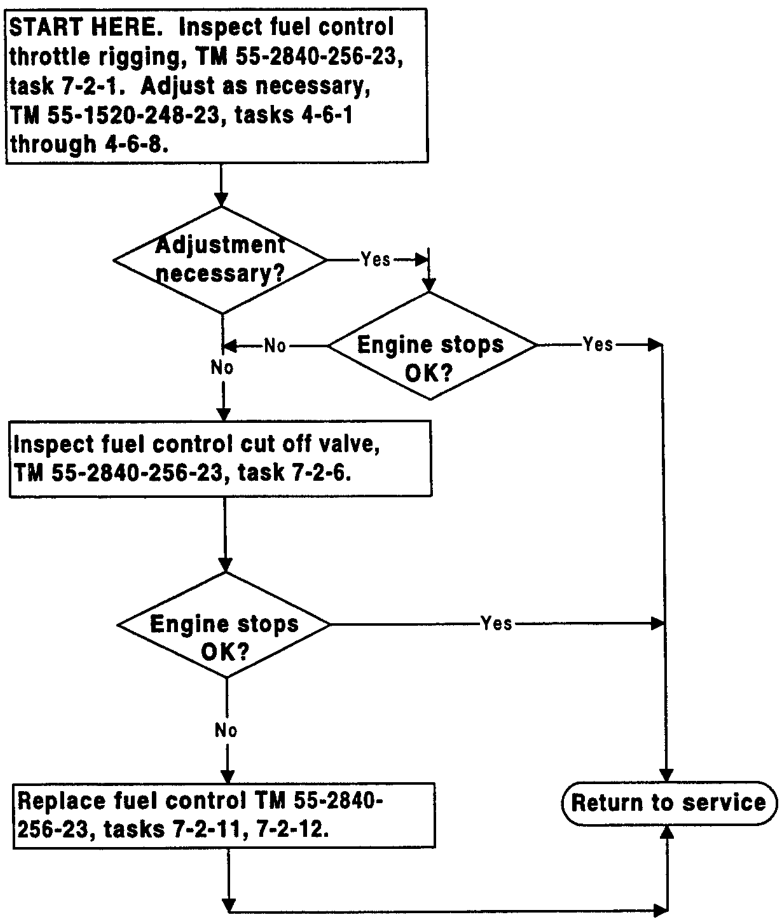
Yes → Return to service

No → Replace breather gearshaft lip seal, TM 55-2840-256-23, task 6-1-4. This also requires engine removal/ reinstallation, TM 55-1520-248-23, tasks 4-1-1, 4-1-2; compressor module removal/reinstallation, TM 55-2840-256-23, tasks 3-1-1, 3-1-2; and turbine module removal/ reinstallation, TM 55-2840-256-23, tasks 5-1-2, 5-1-3. Ground run engine to check.

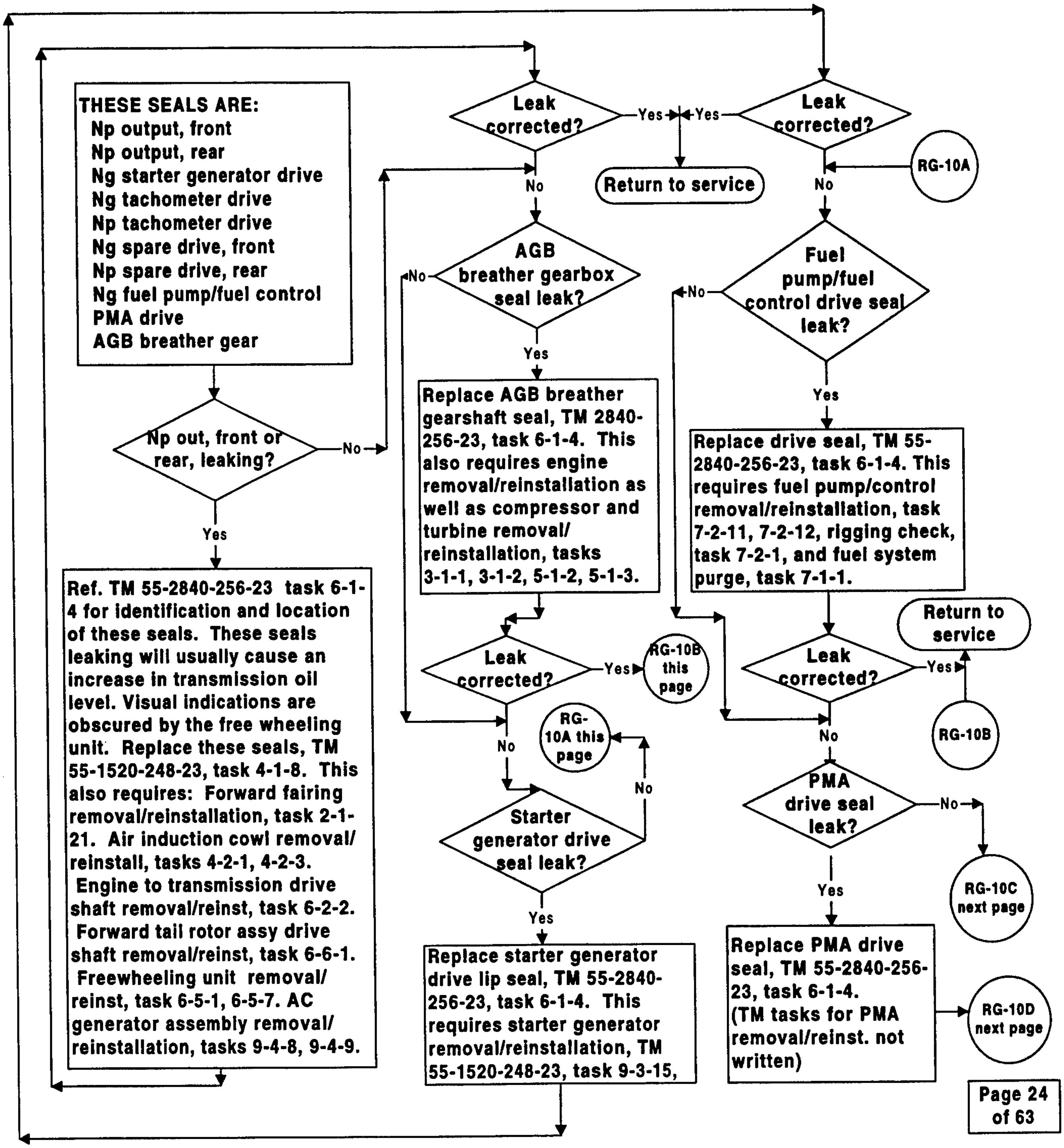
→ Return to service

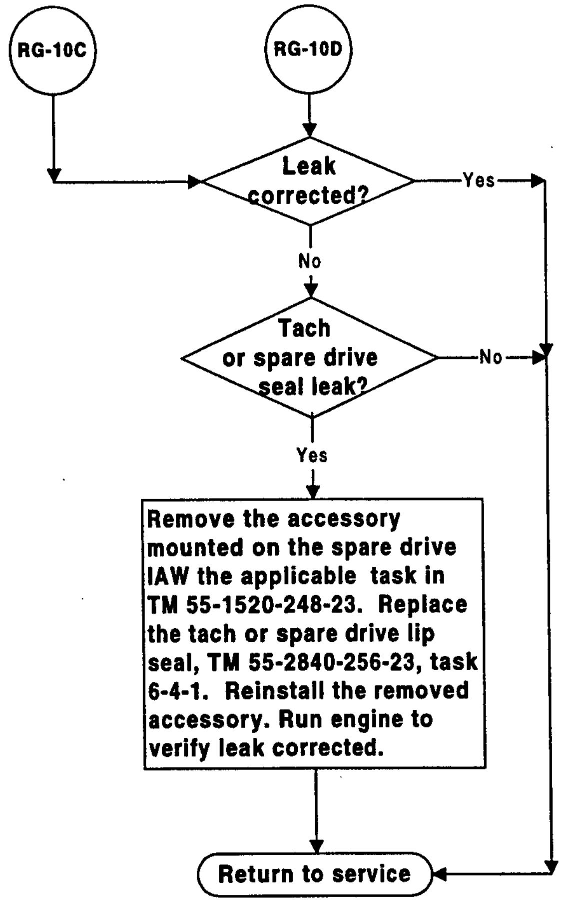
RG-8 UNABLE TO STOP ENGINE WITH FUEL CONTROL THROTTLE MOVEMENT TO CUT OFF.

THIS MAY BE CAUSED BY: Fuel control throttle rigging or security. Separation of the throttle to cut off valve linkage on the fuel control. Fuel control cut off valve internal failure.



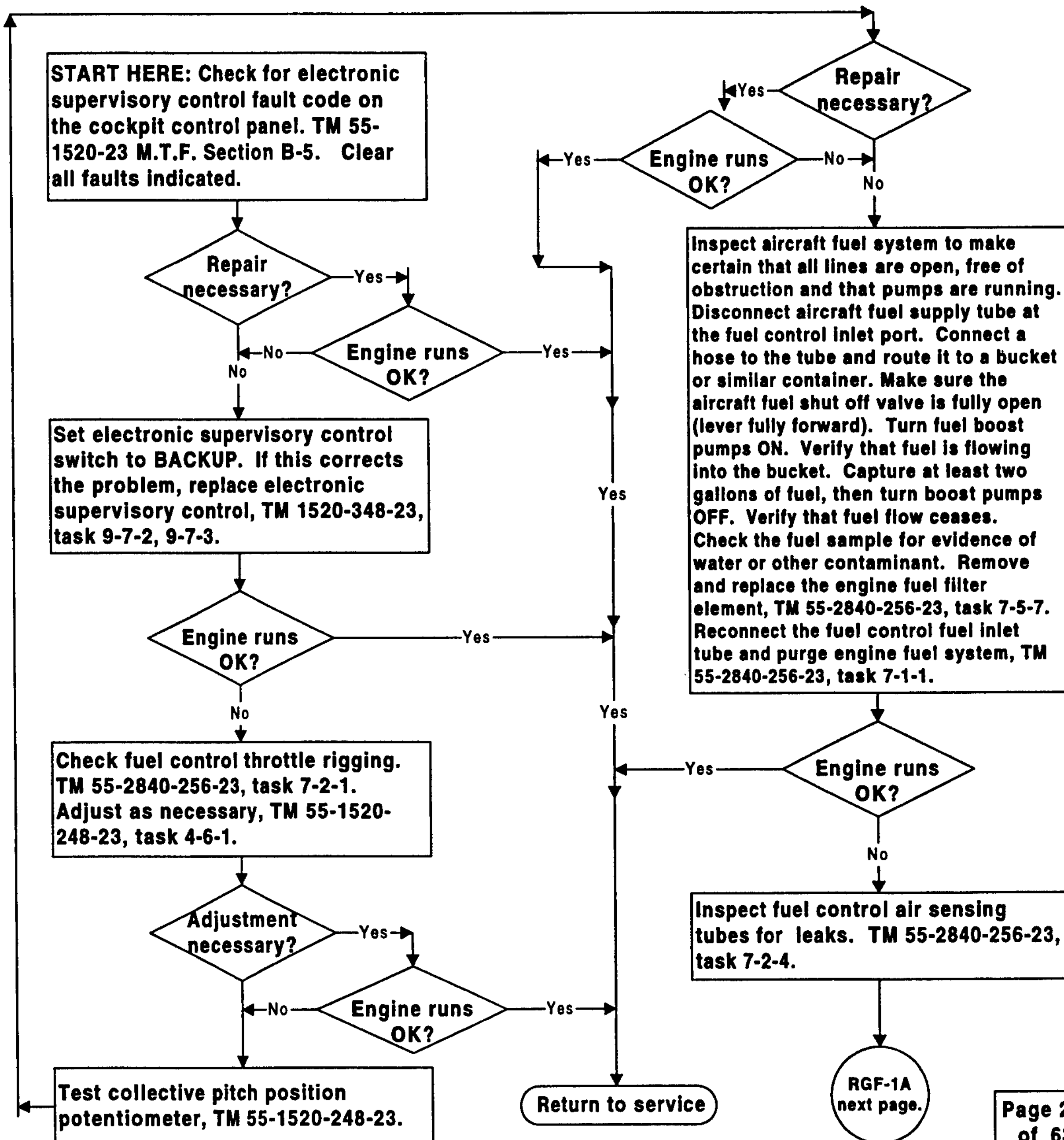
IF LEAKAGE FROM ANY OF THE DRIVE SEALS IS HIGH ENOUGH TO INFLUENCE ENGINE OIL CONSUMPTION OR TO CAUSE OIL WETNESS ON ENGINE OR ACCESSORY EXTERIOR SURFACES, ALL EXCEPT THE AGB BREATHER GEAR SEAL CAN BE REPLACED WITHOUT REMOVING THE ENGINE.

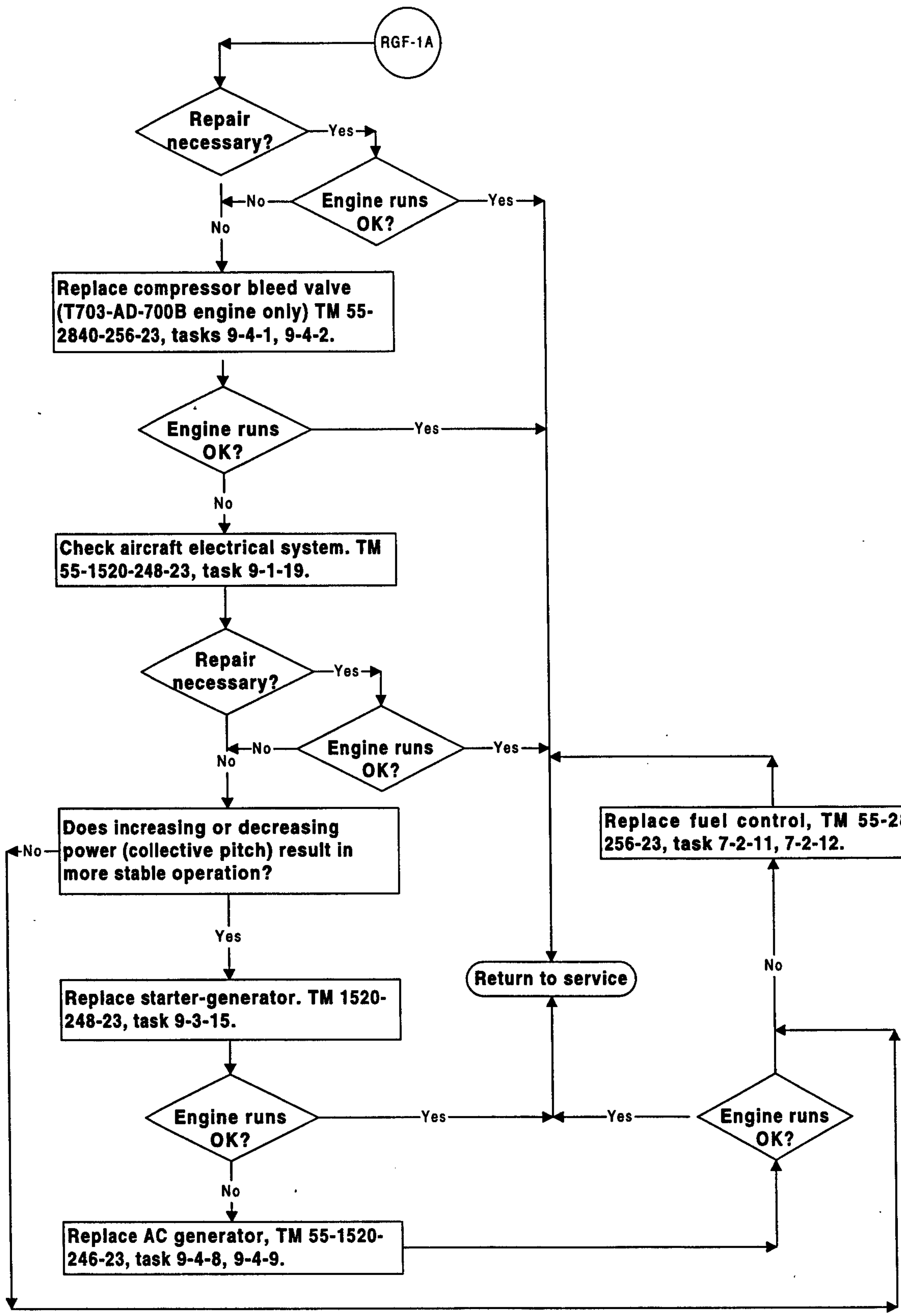



RG-10C
RG-10D
Leak corrected?
Yes
No
Tach or spare drive seal leak?
No
Yes
Remove the accessory mounted on the spare drive IAW the applicable task in TM 55-1520-248-23. Replace the tach or spare drive lip seal, TM 55-2840-256-23, task 6-4-1. Reinstall the removed accessory. Run engine to verify leak corrected.
Return to service

RGF-1. ENGINE UNSTABLE IN POWER RANGE. Page 1 of 2

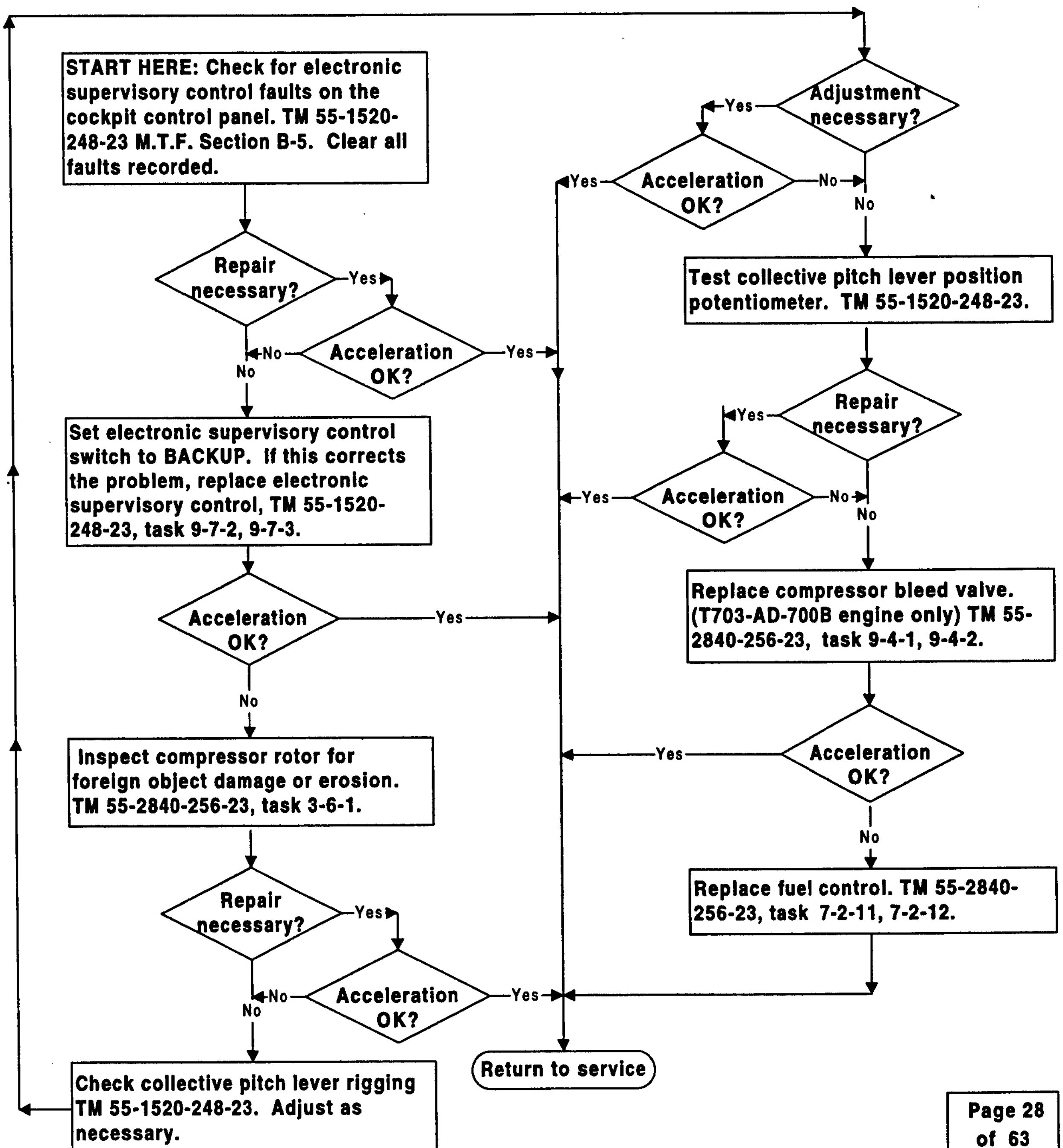
THIS MAY BE CAUSED BY: Collective pitch position potentiometer. Restriction in fuel supply. Fuel control throttle rigging or security. Fuel control air sensing tube leak. Compressor bleed control valve (T703-AD 700B engine only). Aircraft electrical harness. Out of balance condition of the starter generator creating a vibration frequency which upsets the fuel control governing function. Fuel control malfunction. Electronic supervisory control.




RGF-1A
Repair necessary?
Yes
No
Engine runs OK?
Yes
No
Replace compressor bleed valve (T703-AD-700B engine only) TM 55-2840-256-23, tasks 9-4-1, 9-4-2.
Engine runs OK?
Yes
No
Check aircraft electrical system. TM 55-1520-248-23, task 9-1-19.
Repair necessary?
Yes
No
Engine runs OK?
Yes
No
Does increasing or decreasing power (collective pitch) result in more stable operation?
No
Yes
Replace starter-generator. TM 1520-248-23, task 9-3-15.
Engine runs OK?
Yes
No
Replace AC generator, TM 55-1520-246-23, task 9-4-8, 9-4-9.
Return to service
Replace fuel control, TM 55-2840-256-23, task 7-2-11, 7-2-12.
No
Engine runs OK?
Yes

RGF-2. COMPRESSOR SURGES DURING ACCELERATION FROM IDLE TO GOVERNING AT 100% Ng.

THIS MAY BE CAUSED BY: Compressor damage or degradation. Compressor inlet blockage. Pressure-thermal distortion. Bleed valve closing too soon or stuck closed (T703-AD-700B engine only). Gas generator 1st stage nozzle area reduced by blockage from ingested sand and dust deposits. Fuel control. Electronic supervisory control.



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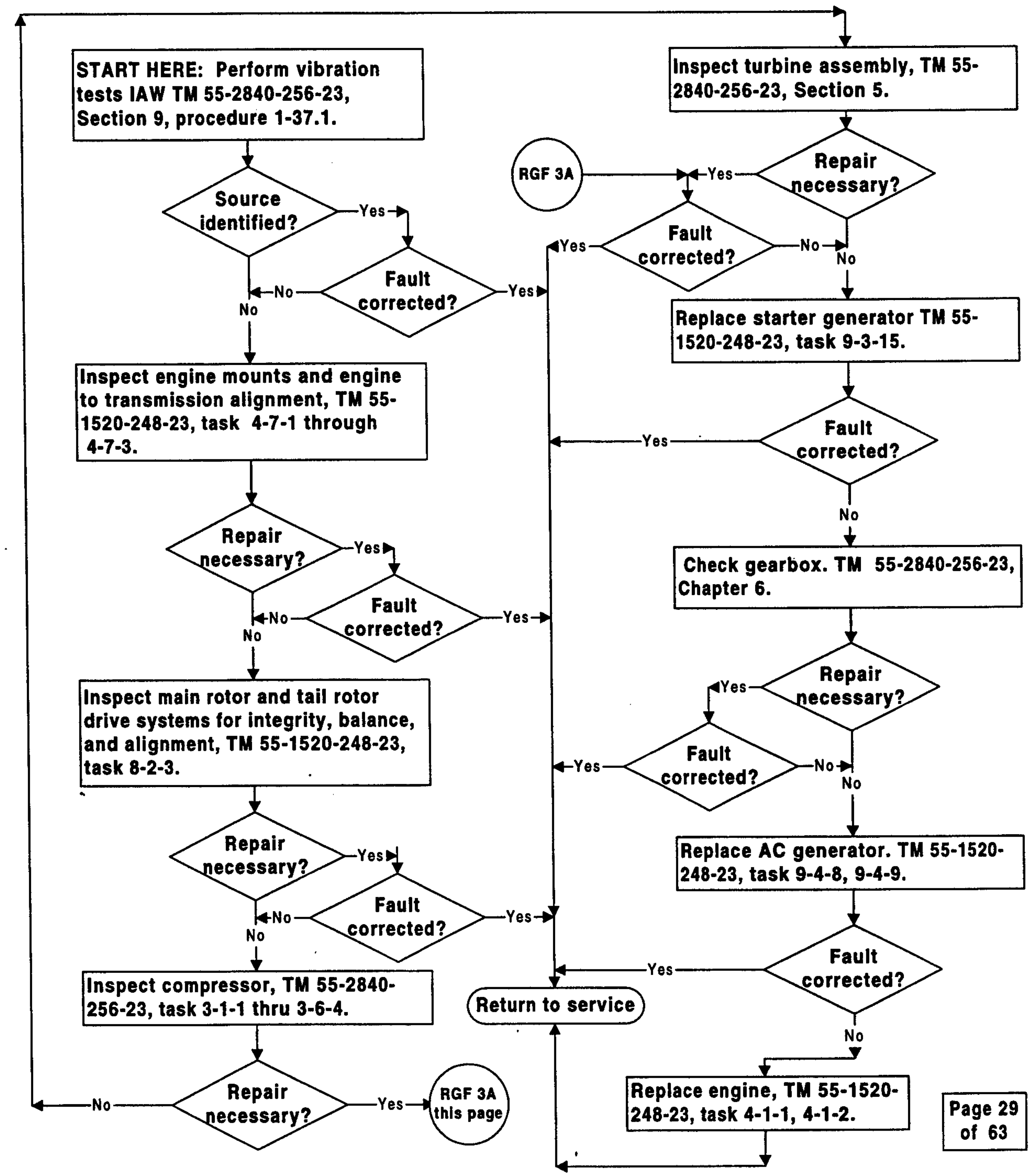
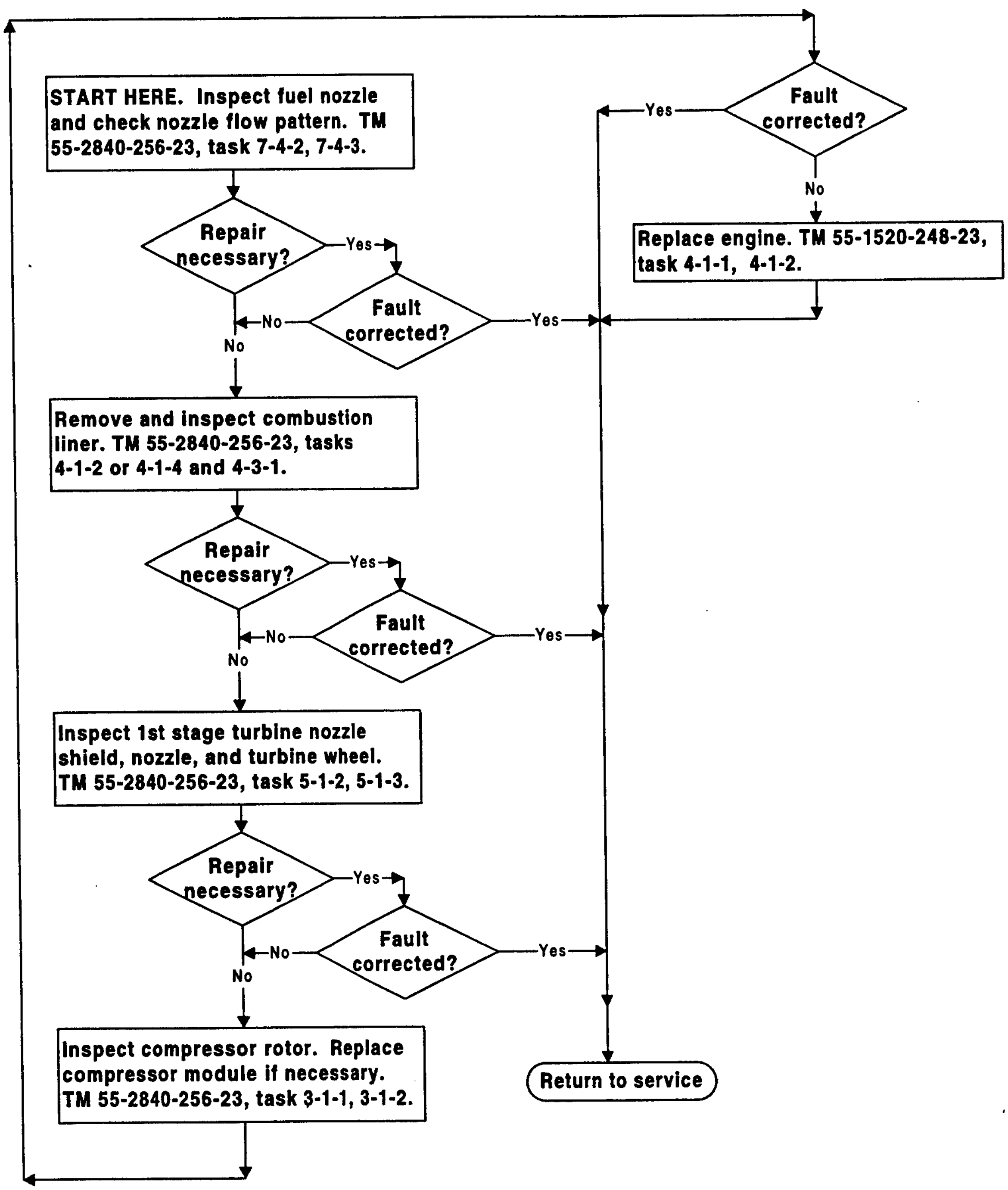
THIS MAY BE CAUSED BY: Engine mount looseness. Engine alignment. Main rotor or tail rotor drive systems. Damage or failure of compressor rotor. GGT or PT rotor. Main or AGB bearings. GG or PT rotor unbalance. Gear failure. Gear tooth match. Accessory unbalance.



RGF-4 EXHAUST DUCT EMITTING SPARKS. Page 1 of 1

This may be caused by: Combustion liner damage. Turbine damage. Compressor damage. Fuel nozzle.



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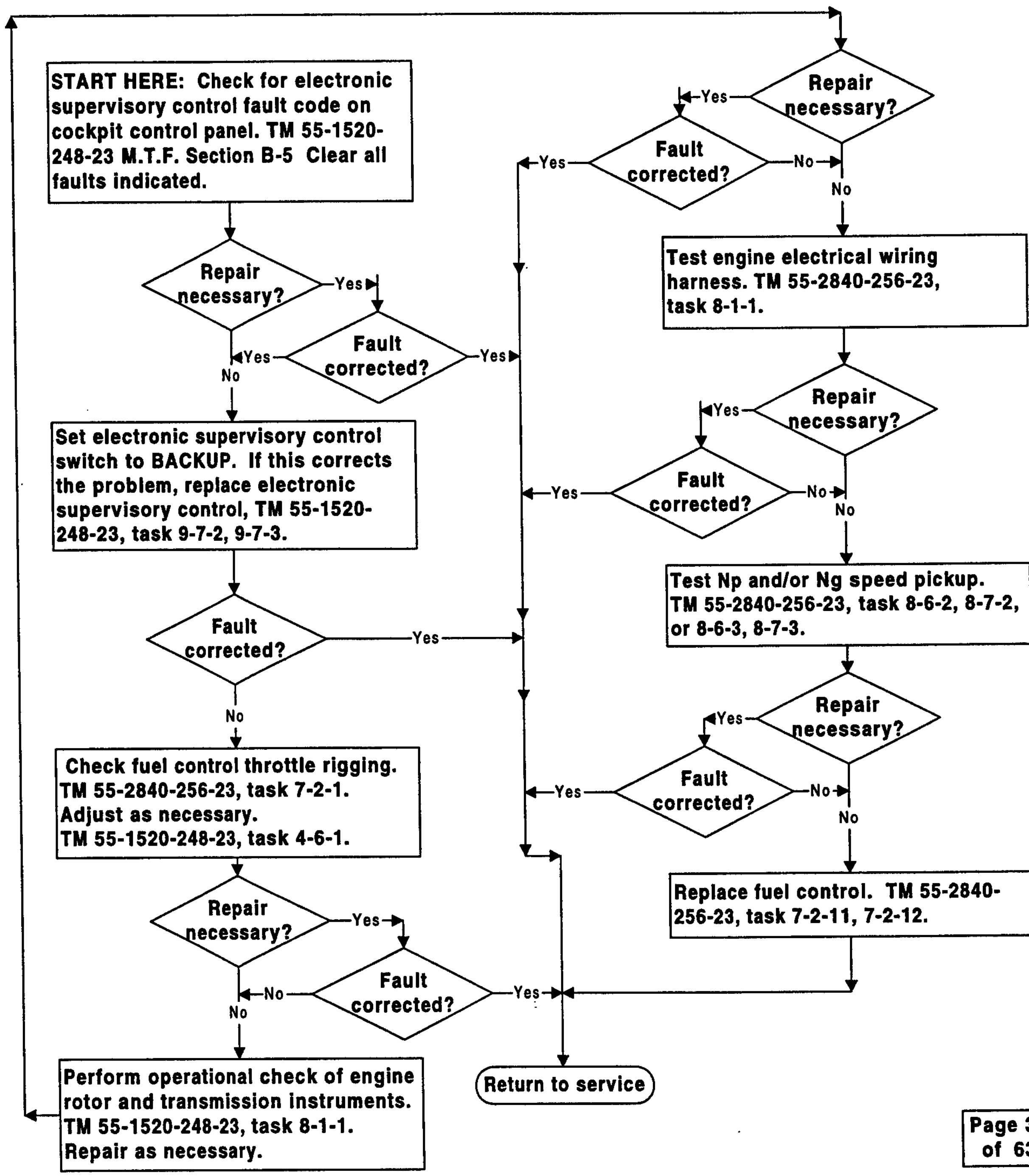
RGF-5 ENGINE Ng OR Np OVERSPEEDS.

This may be caused by: Fuel control throttle rigging or security. Speed measurement/ indicating systems error. Engine wiring harness. Aircraft to engine wiring harness. Extreme flight maneuver. Output load loss. Fuel control failure. Electronic supervisory control.



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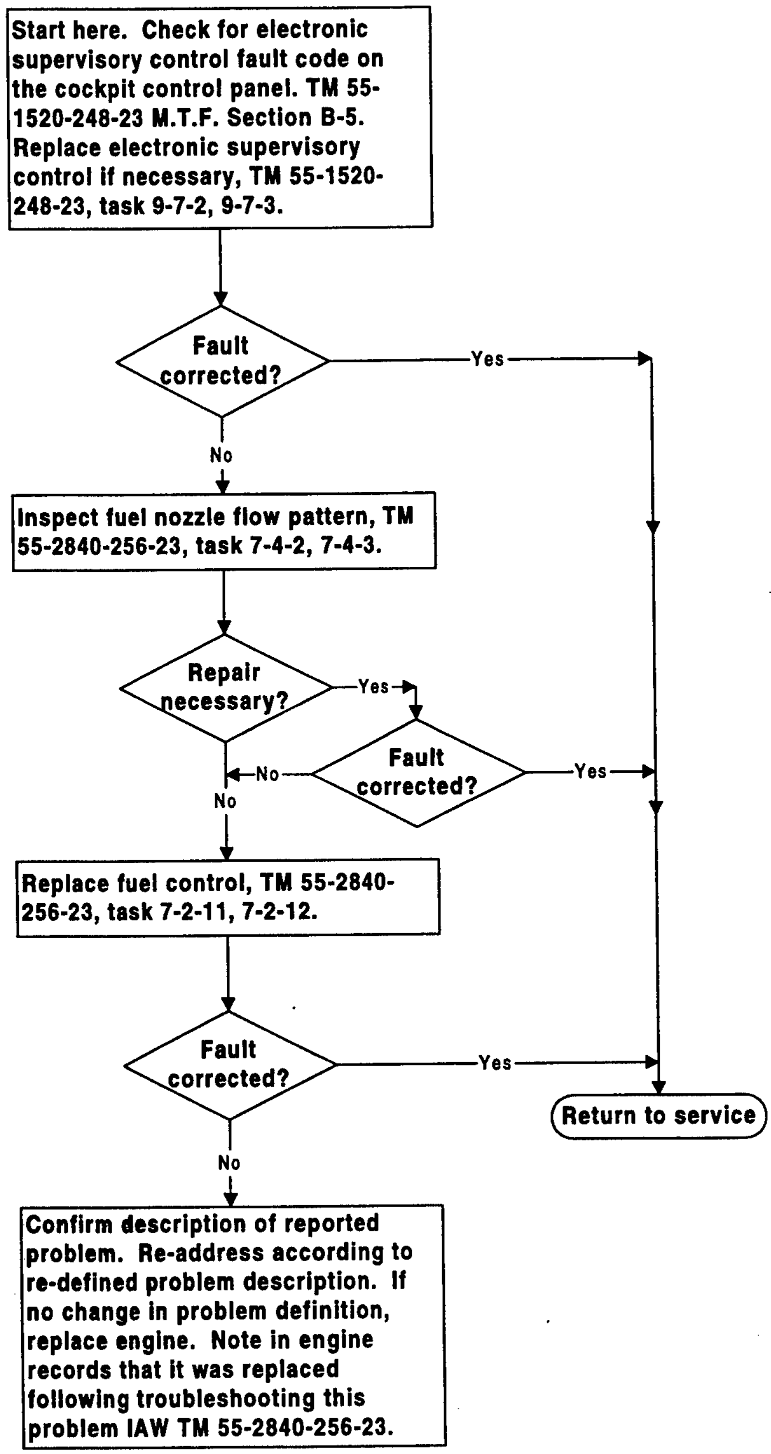
RGF-6 EXCESSIVE EXHAUST TORCHING DURING TRANSIENTS. Page 1 of 1

THIS MAY BE CAUSED BY: Fuel nozzle. Fuel control. Electronic supervisory control.



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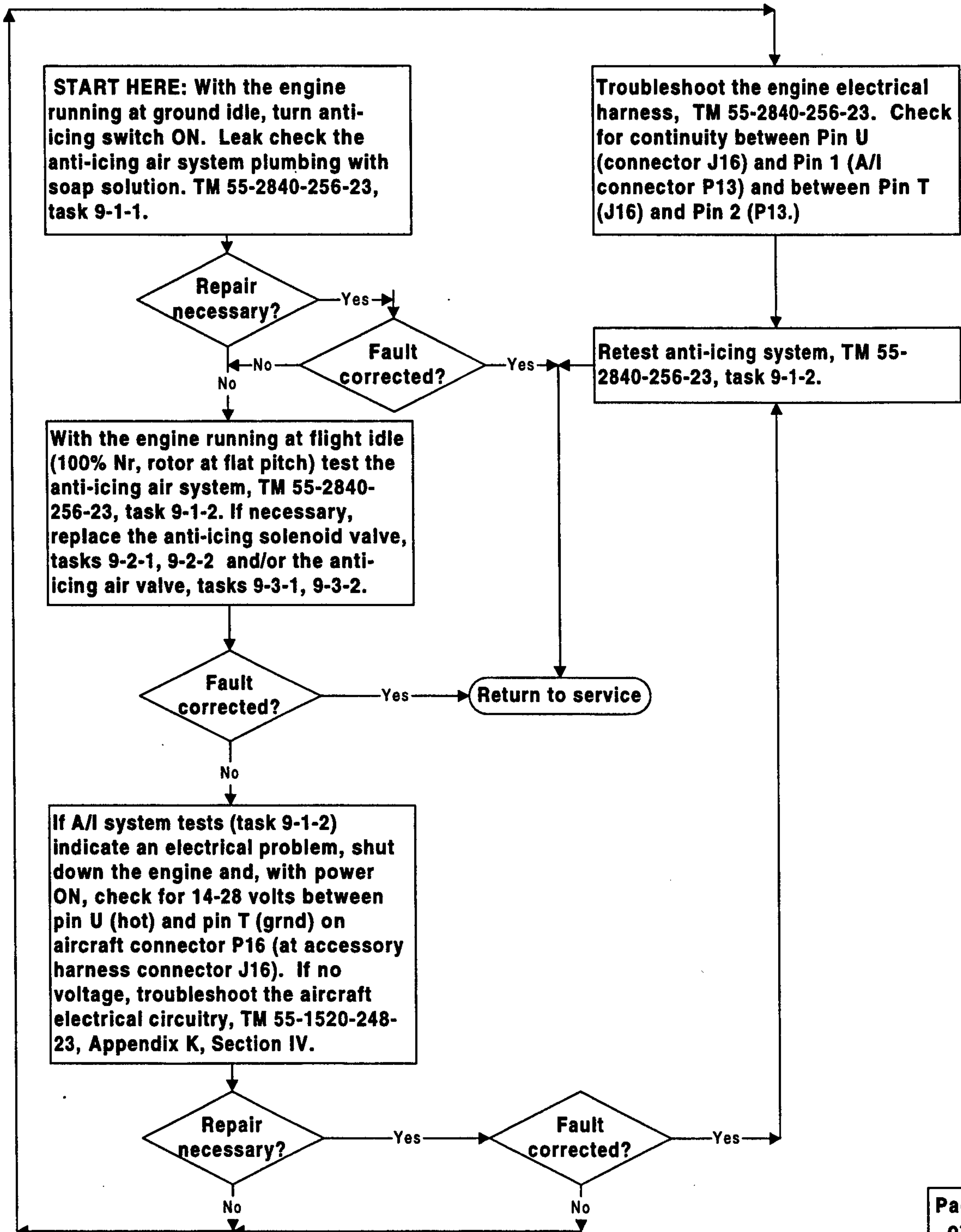
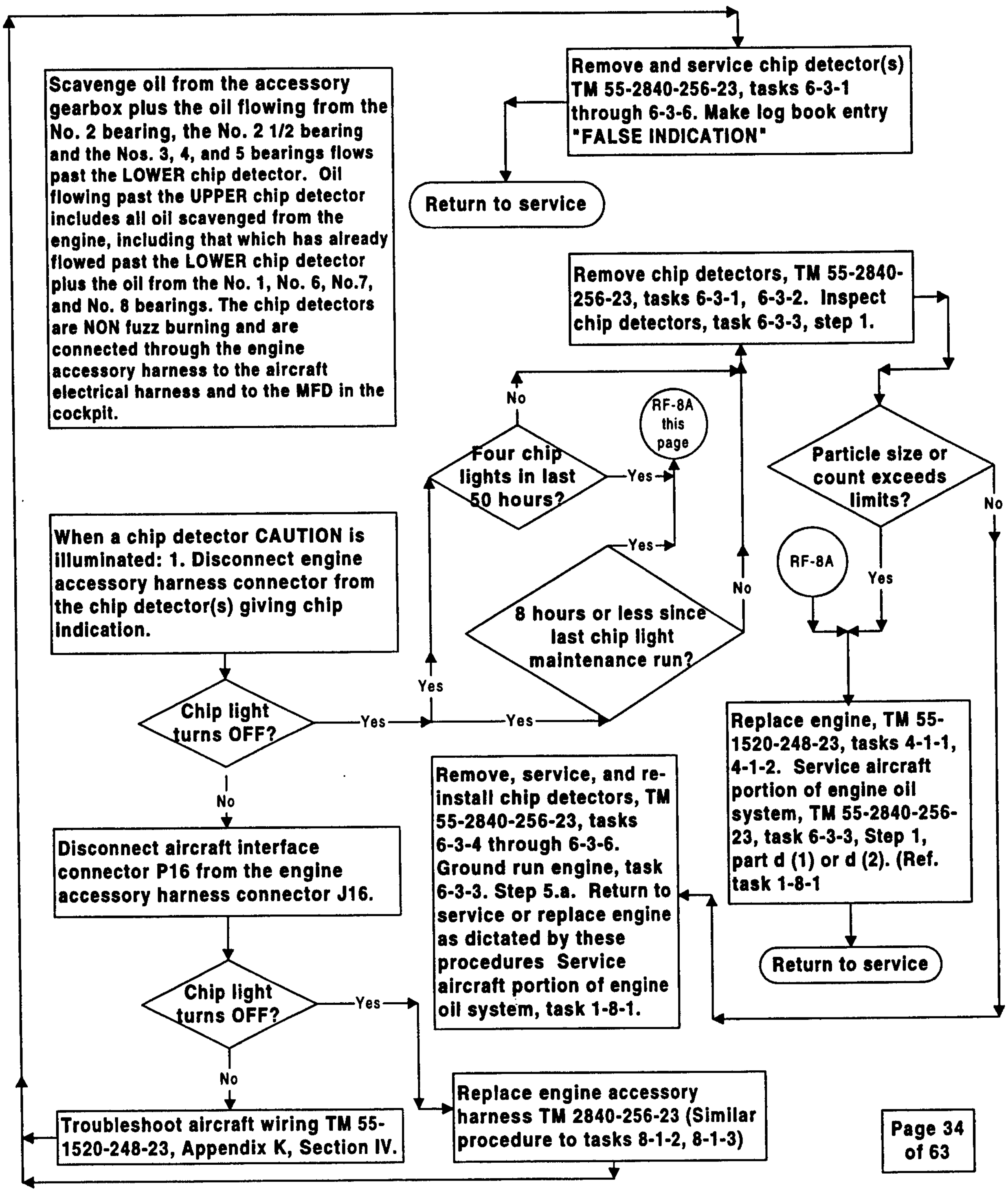
RGF-7. LACK OF ANTI ICE AIR. Page 1 of 1

THIS MAY BE CAUSED BY: Cracked anti-ice air tube. Defective switch. Plug installed in solenoid valve. Anti-icing air valve stuck closed. Solenoid valve not working. Dirt in vane exit slots. Valve to scroll gasket failed.



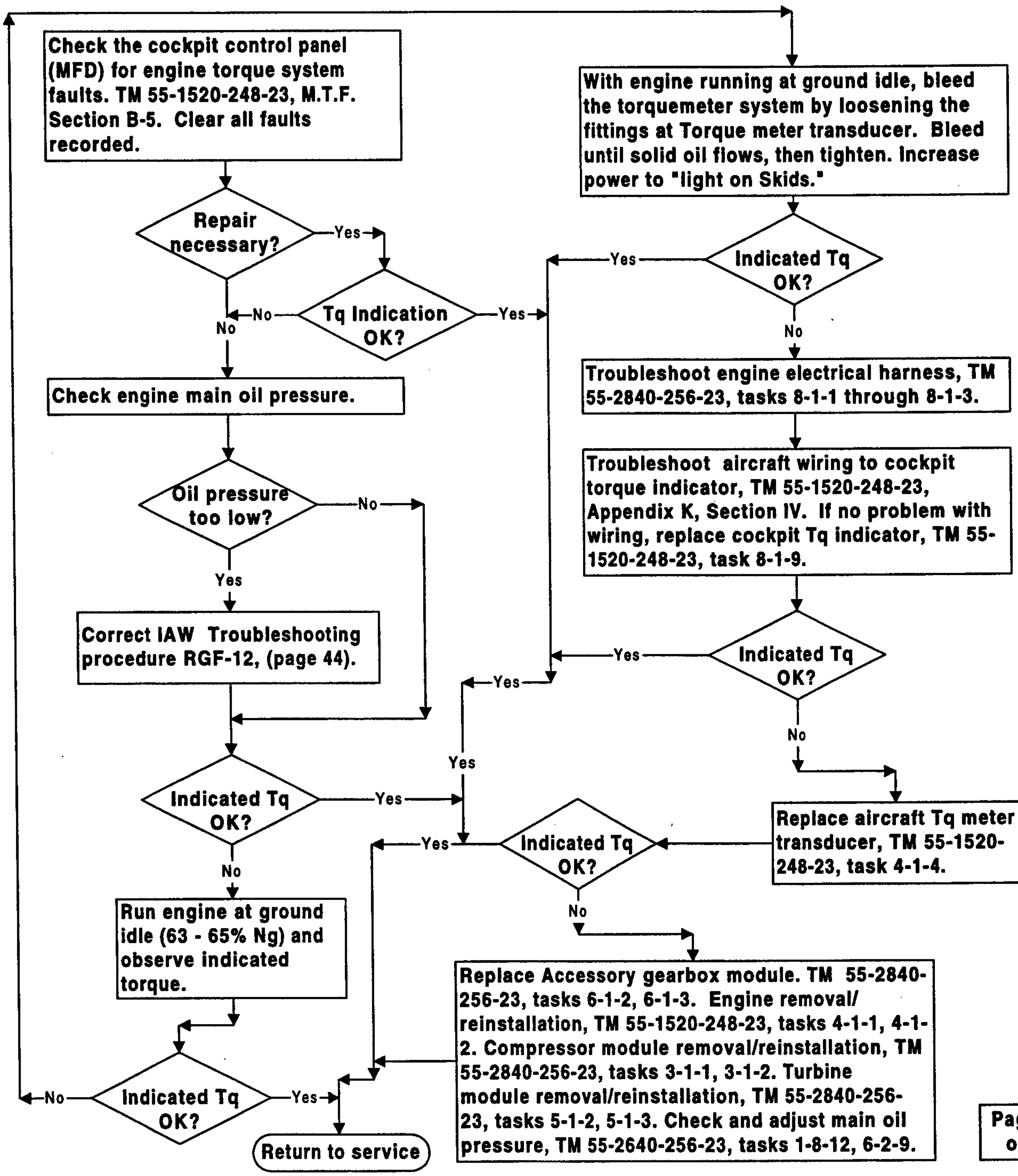
RGF-8 MAGNETIC PLUG WARNING. Page 1 of 1

THIS IS INDICATION OF ENGINE METAL GENERATION WHICH MUST BE IDENTIFIED AND CORRECTED.



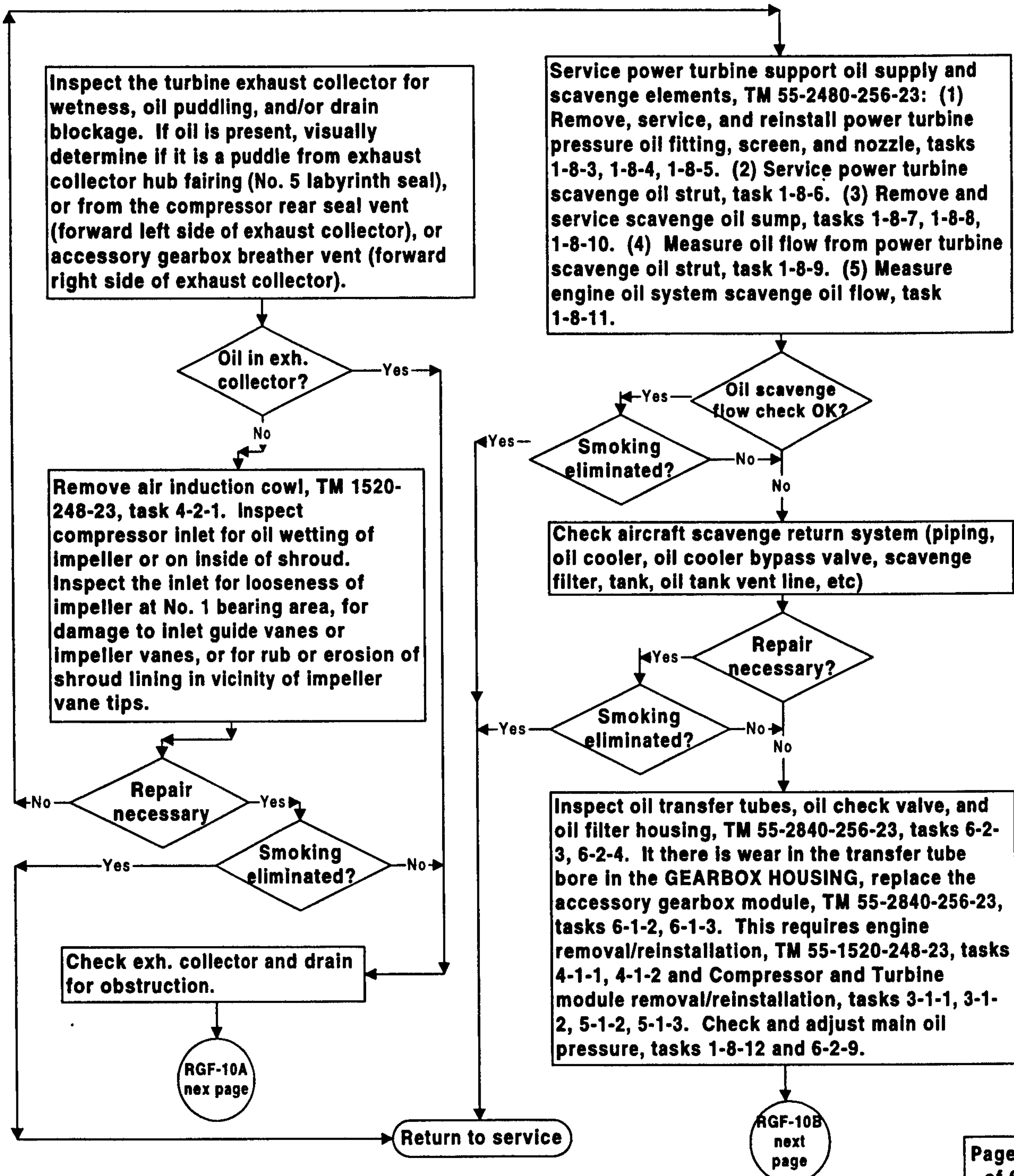
RGF-9 FAULTY TORQUEMETER INDICATION. Page 1 of 1

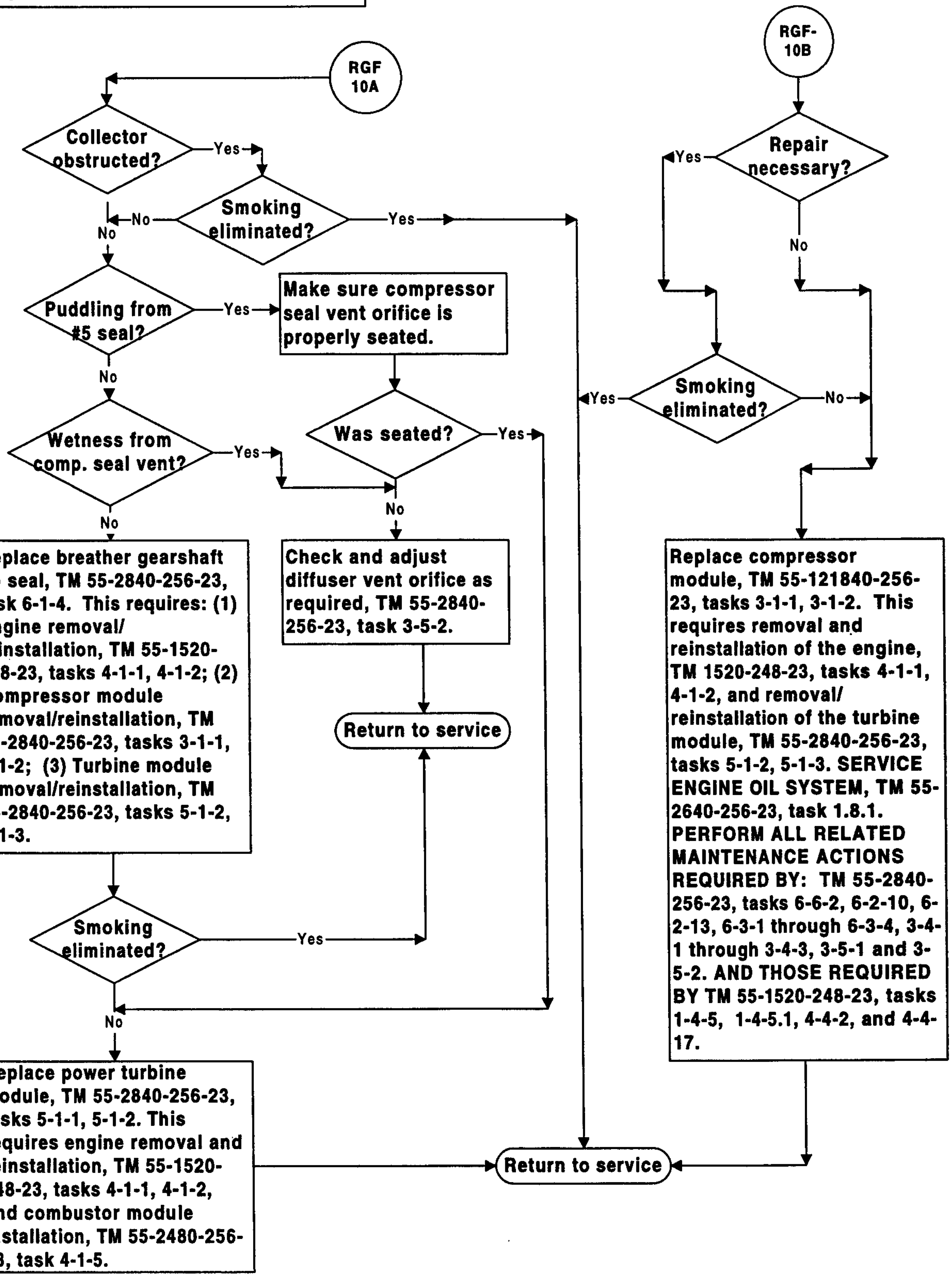
THIS MAY BE CAUSED BY: Clogged torquemeter bleed orifice. Clogged pressure sensing line. Torque measuring system. Torque transducer or related wiring faulty. Torquemeter supporting bearing failure. Low main oil pressure.



RGF-10 CONTINUOUS EXHAUST SMOKING. Page 1 of 2

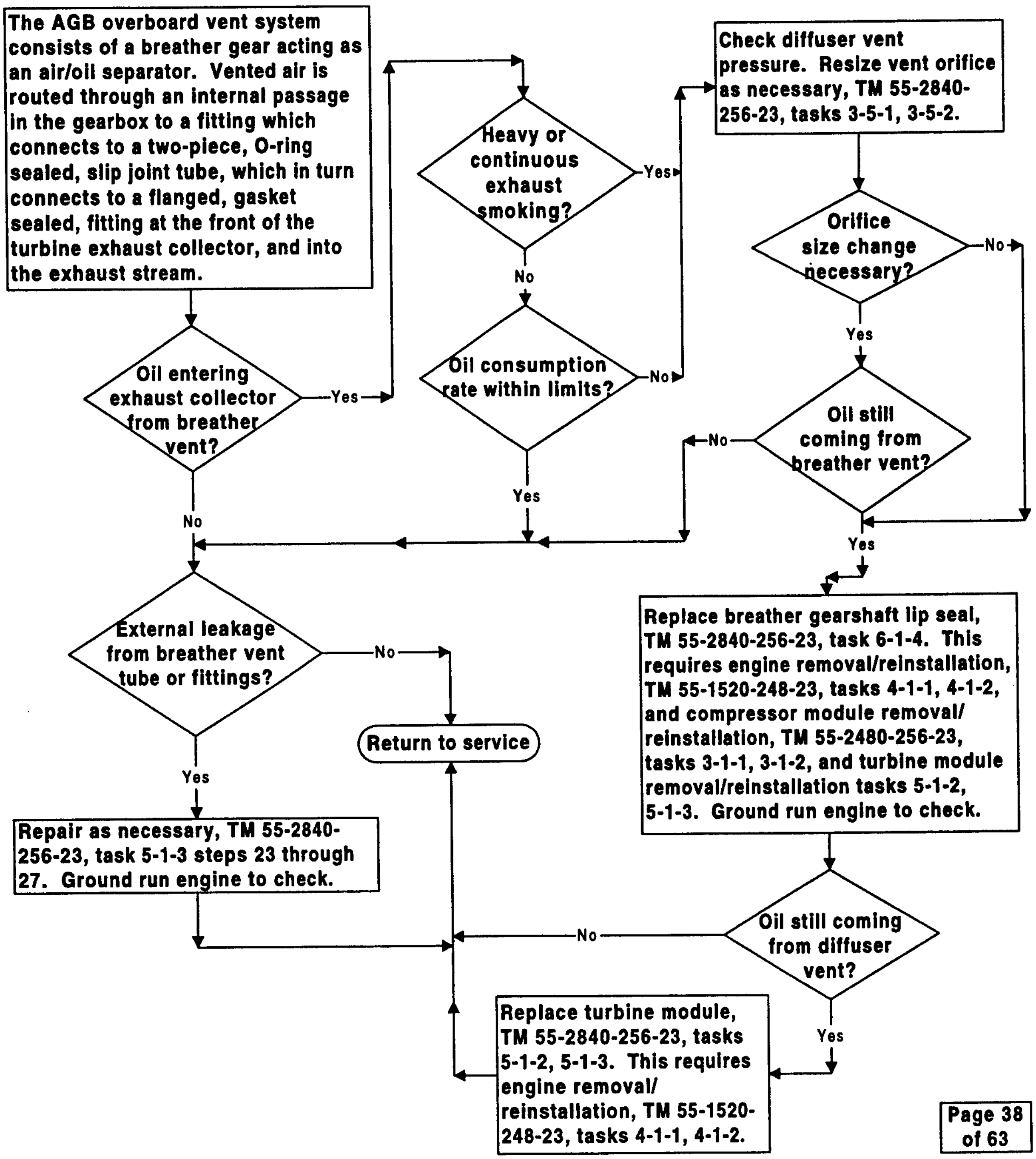
THIS MAY BE CAUSED BY: Exhaust collector drain blocked. Restricted power turbine sump scavenge strut. Degraded oil pump. No. 5 seal leak. No. 1 seal leak. Failed No. 1 bearing. Defective turbine seal. AGB breather gear lip seal. Oil transfer tubes. Aircraft scavenging system.




RGF 10A
Collector obstructed?
Yes
No
Smoking eliminated?
Yes
No
Puddling from #5 seal?
Yes
Make sure compressor seal vent orifice is properly seated.
No
Wetness from comp. seal vent?
Yes
Was seated?
Yes
No
No
Replace breather gearshaft lip seal, TM 55-2840-256-23, task 6-1-4. This requires: (1) Engine removal/ reinstallation, TM 55-1520-248-23, tasks 4-1-1, 4-1-2; (2) Compressor module removal/reinstallation, TM 55-2840-256-23, tasks 3-1-1, 3-1-2; (3) Turbine module removal/reinstallation, TM 55-2840-256-23, tasks 5-1-2, 5-1-3.
Check and adjust diffuser vent orifice as required, TM 55-2840-256-23, task 3-5-2.
Return to service
Smoking eliminated?
Yes
No
Replace power turbine module, TM 55-2840-256-23, tasks 5-1-1, 5-1-2. This requires engine removal and reinstallation, TM 55-1520-248-23, tasks 4-1-1, 4-1-2, and combustor module installation, TM 55-2480-256-23, task 4-1-5.
Return to service
RGF-10B
Repair necessary?
Yes
No
Smoking eliminated?
Yes
No
Replace compressor module, TM 55-121840-256-23, tasks 3-1-1, 3-1-2. This requires removal and reinstallation of the engine, TM 1520-248-23, tasks 4-1-1, 4-1-2, and removal/ reinstallation of the turbine module, TM 55-2840-256-23, tasks 5-1-2, 5-1-3. SERVICE ENGINE OIL SYSTEM, TM 55-2640-256-23, task 1.8.1. PERFORM ALL RELATED MAINTENANCE ACTIONS REQUIRED BY: TM 55-2840-256-23, tasks 6-6-2, 6-2-10, 6-2-13, 6-3-1 through 6-3-4, 3-4-1 through 3-4-3, 3-5-1 and 3-5-2. AND THOSE REQUIRED BY TM 55-1520-248-23, tasks 1-4-5, 1-4-5.1, 4-4-2, and 4-4-17.

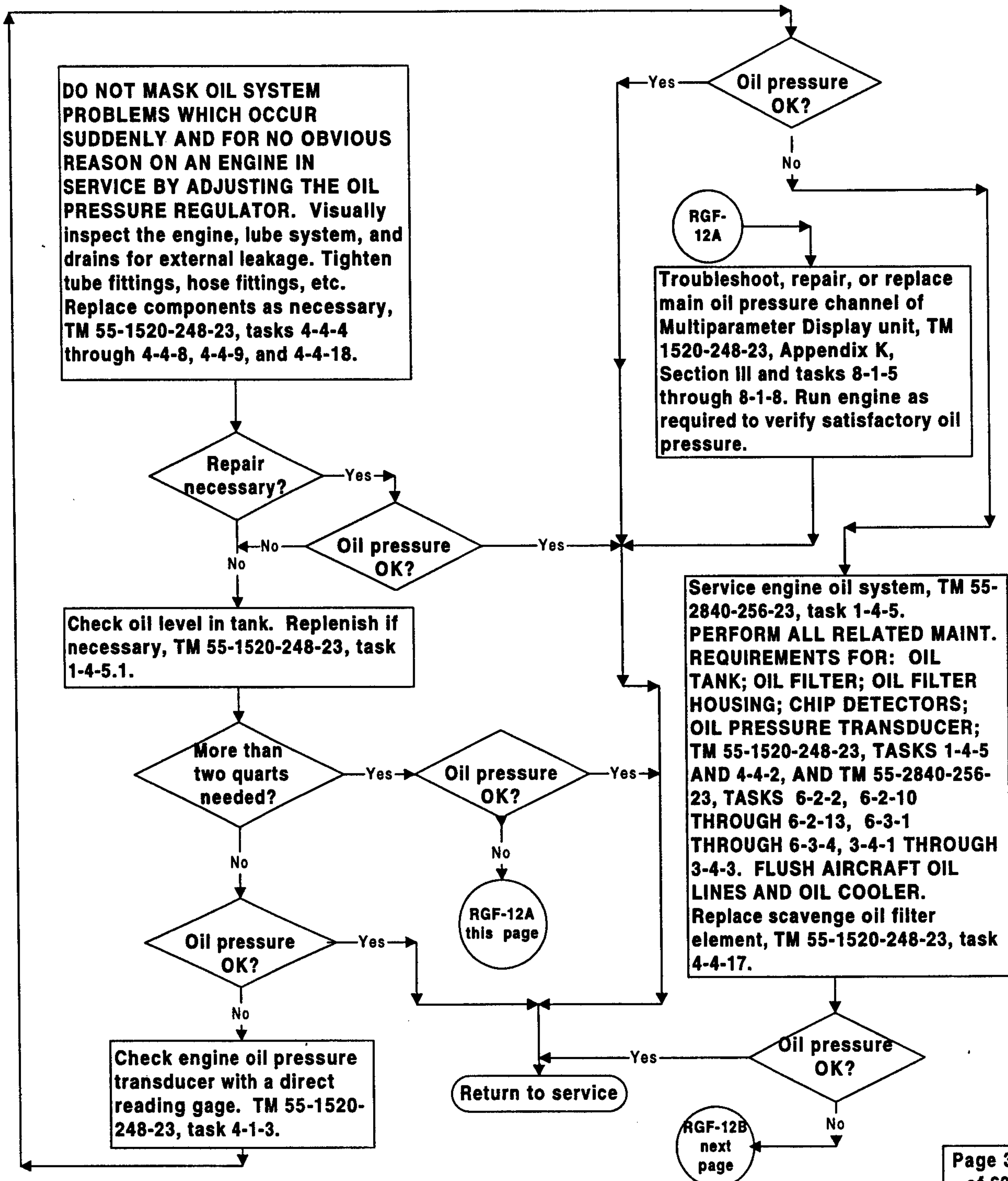
RGF-11 OIL SPEWING OR LEAKING FROM GEARBOX VENT AND/ OR TUBING JOINTS. Page 1 of 1

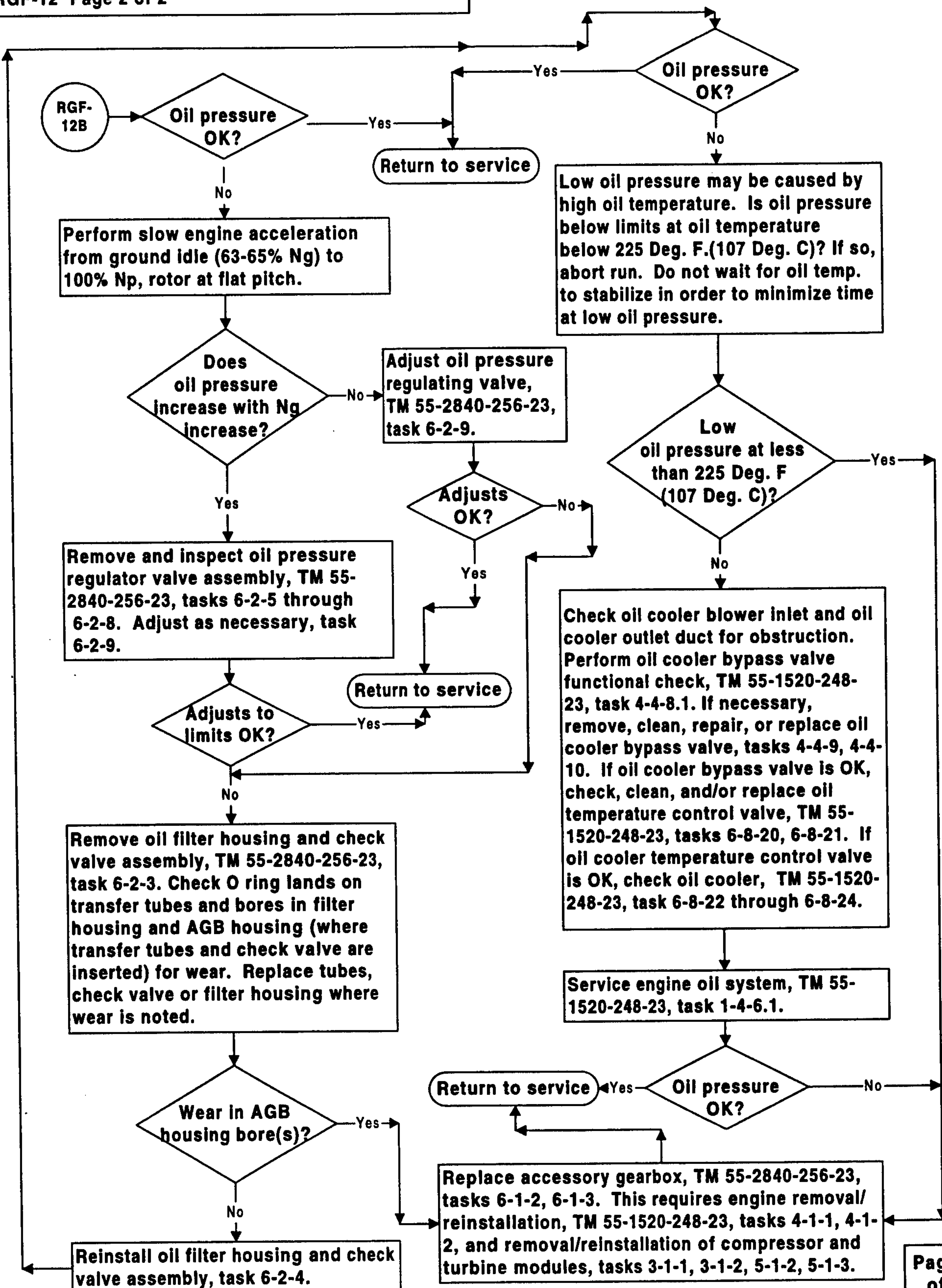
THIS MAY BE CAUSED BY: AGB breather gearshaft lip seal leakage. High gearbox pressure caused by diffuser vent orifice too small or damaged. Worn or damaged turbine seals in the cooling air or pressure balance circuits.



RGF-12 LOW OIL PRESSURE.

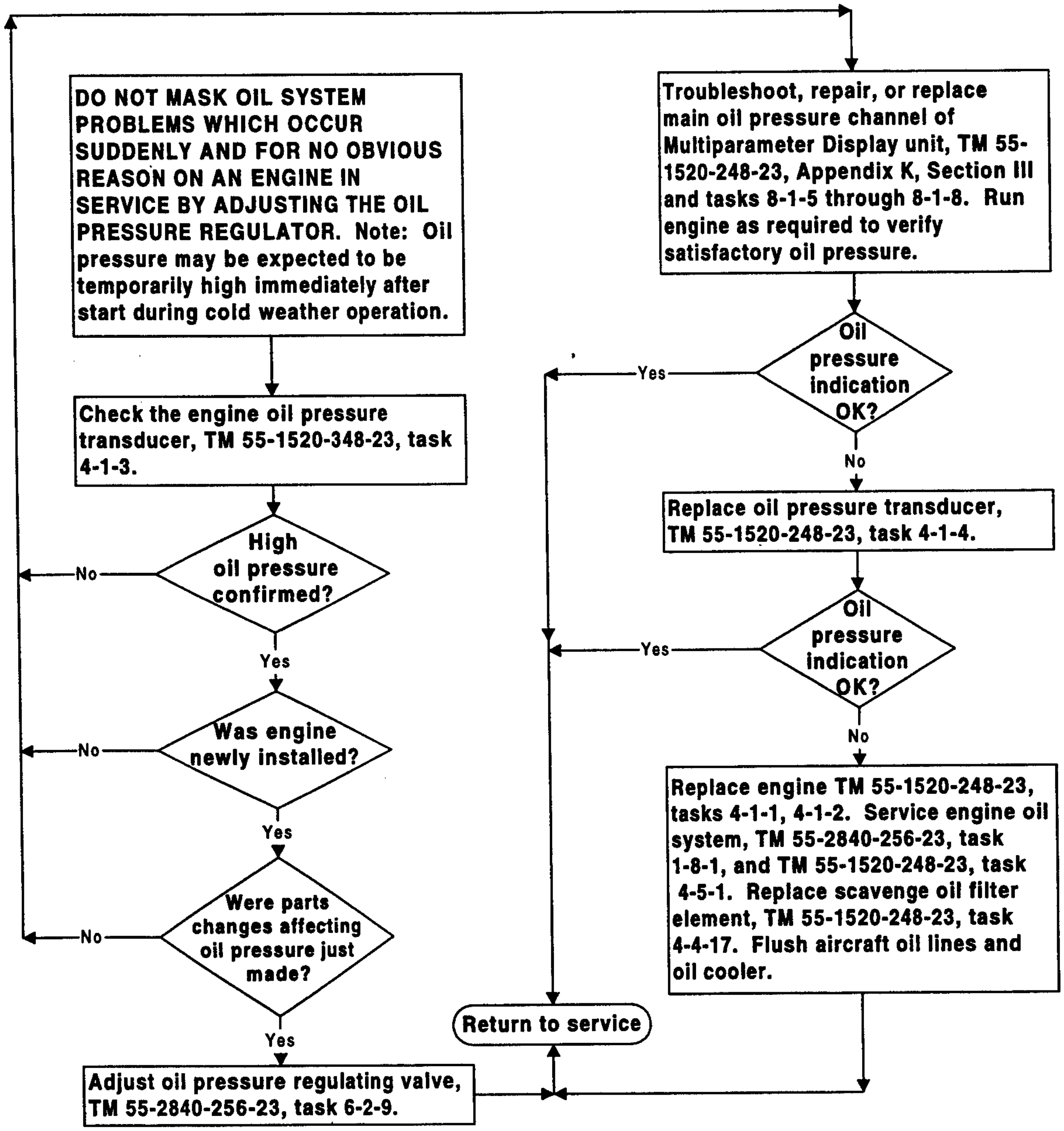
THIS MAY BE CAUSED BY: Oil level. Oil pressure measurement system. Oil pressure regulator. Engine oil filter. Degraded oil pump. Contaminated oil. Oil transfer tubes. Other internal oil leak. External leak. Oil supply restriction. High oil temperature.




RGF-12B
Oil pressure OK?
Yes
No
Return to service
Perform slow engine acceleration from ground idle (63-65% Ng) to 100% Np, rotor at flat pitch.
Does oil pressure increase with Ng increase?
No
Adjust oil pressure regulating valve, TM 55-2840-256-23, task 6-2-9.
Adjusts OK?
Yes
No
Return to service
Yes
Remove and inspect oil pressure regulator valve assembly, TM 55-2840-256-23, tasks 6-2-5 through 6-2-8. Adjust as necessary, task 6-2-9.
Adjusts to limits OK?
Yes
No
Remove oil filter housing and check valve assembly, TM 55-2840-256-23, task 6-2-3. Check O ring lands on transfer tubes and bores in filter housing and AGB housing (where transfer tubes and check valve are inserted) for wear. Replace tubes, check valve or filter housing where wear is noted.
Wear in AGB housing bore(s)?
Yes
No
Reinstall oil filter housing and check valve assembly, task 6-2-4.
Oil pressure OK?
Yes
No
Low oil pressure may be caused by high oil temperature. Is oil pressure below limits at oil temperature below 225 Deg. F.(107 Deg. C)? If so, abort run. Do not wait for oil temp. to stabilize in order to minimize time at low oil pressure.
Low oil pressure at less than 225 Deg. F (107 Deg. C)?
Yes
No
Check oil cooler blower inlet and oil cooler outlet duct for obstruction. Perform oil cooler bypass valve functional check, TM 55-1520-248-23, task 4-4-8.1. If necessary, remove, clean, repair, or replace oil cooler bypass valve, tasks 4-4-9, 4-4-10. If oil cooler bypass valve is OK, check, clean, and/or replace oil temperature control valve, TM 55-1520-248-23, tasks 6-8-20, 6-8-21. If oil cooler temperature control valve is OK, check oil cooler, TM 55-1520-248-23, task 6-8-22 through 6-8-24.
Service engine oil system, TM 55-1520-248-23, task 1-4-6.1.
Oil pressure OK?
Yes
No
Return to service
Replace accessory gearbox, TM 55-2840-256-23, tasks 6-1-2, 6-1-3. This requires engine removal/reinstallation, TM 55-1520-248-23, tasks 4-1-1, 4-1-2, and removal/reinstallation of compressor and turbine modules, tasks 3-1-1, 3-1-2, 5-1-2, 5-1-3.

RGF-13 HIGH OIL PRESSURE.

THIS MAY BE CAUSED BY: Oil pressure measurement system. Oil passage obstruction in AGB. Turbine oil supply restriction.



RGF-14 OIL PRESSURE DROPS OFF SEVERELY WITH NORMAL OIL TEMPERATURE. Page 1 of 1

THIS MAY BE CAUSED BY: Oil level. Pressure measurement system. Oil pressure regulator. Degraded oil pump. Oil transfer tubes. Aircraft oil system flow restriction. Oil foaming.

Check oil level in tank. Replenish if necessary, TM 55-1520-248-23, task 1-4-5.1.

More than two quarts needed?

Yes

Oil pressure OK?

No

No

Yes

Check the oil pressure transducer, TM 55-1520-248-23, task 4-1-3. Replace if necessary, task 4-1-4.

Return to service

Transducer replaced?

Yes

Oil pressure OK?

Yes

No

No

Check the oil pressure regulator, TM 55-2840-256-23, task 6-2-5, 6-2-6. Repair and/or adjust as needed, tasks 6-2-7, 6-2-8. Run engine at 100% NP, rotor at flat pitch until oil temperature stabilizes. Verify that oil pressure does not decrease as oil warms.

Oil pressure drops as oil warms?

No

Adjust oil pressure regulator, TM 55-2840-256-23, task 6-2-9.

Yes

Return to service

Remove oil filter housing and check valve assembly, TM 55-2840-256-23, task 6-2-3. Check O ring lands on transfer tubes and AGB housing (where transfer tubes and check valve are inserted) for wear. Replace tubes, check valve or filter housing where wear is noted.

Wear in AGB housing bores?

No

Reinstall oil filter housing and check valve assembly, TM 55-2840-256-23e, task 6-2-4.

Oil pressure OK?

Yes

No

Troubleshoot, repair, or replace main oil pressure channel of Multiparameter Display unit, TM 55-1520-48-23, Appendix K, Section III, and tasks 8-1-5 through 8-1-8. Run engine as required to verify satisfactory oil pressure.

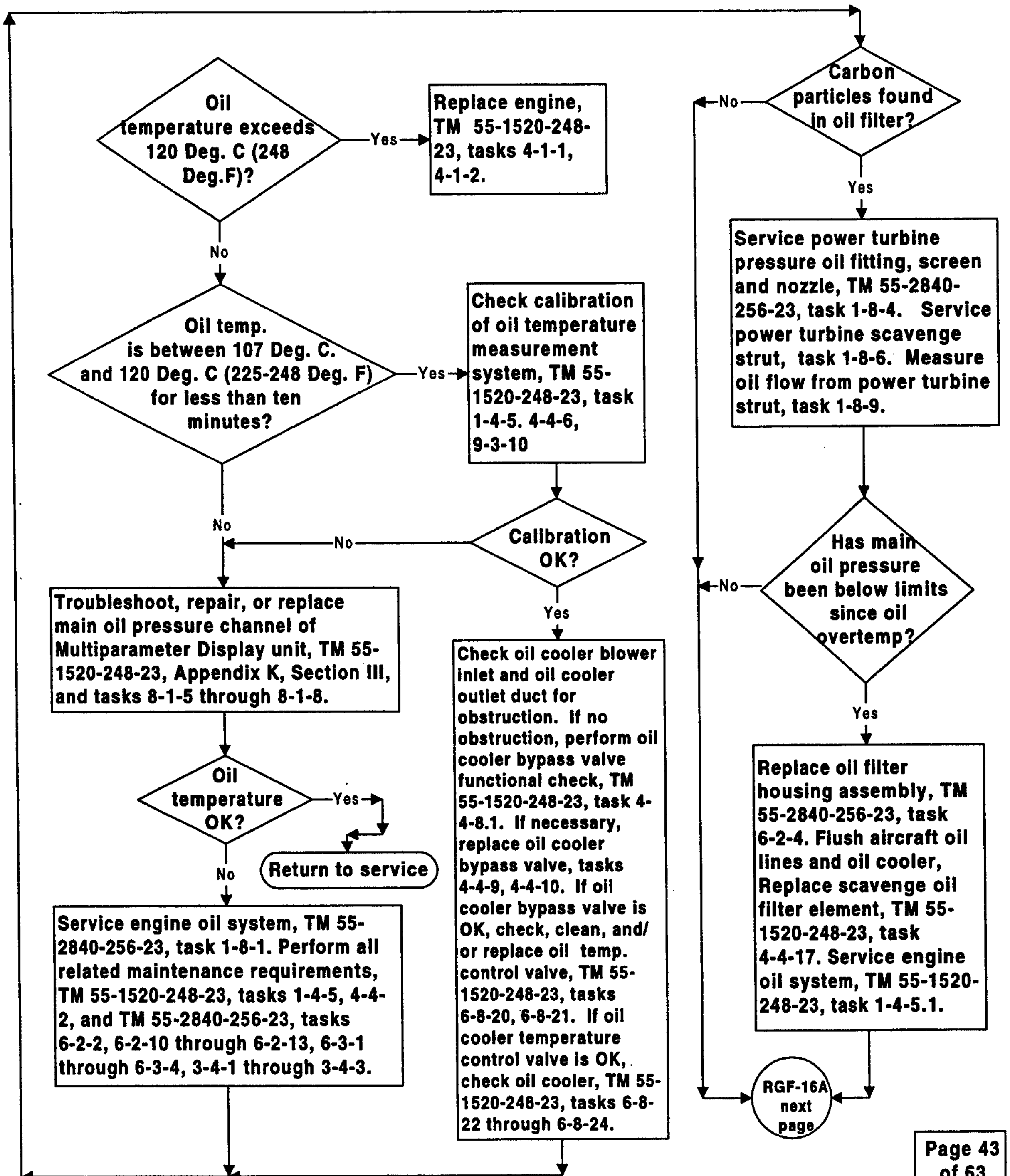
Yes

Replace AGB module, TM 55-2840-256-23, tasks 6-1-2, 6-1-3. This requires engine removal/ reinstallation, TM 55-1520-248-23, tasks 4-1-1, 4-1-2, and compressor and turbine removal/ reinstallation, TM 55-2840-256-23, tasks 3-1-1. 3-1-2, 5-1-2, 5-1-3.

Service engine oil system, TM 55-2840-256-234, tasks 1-8-1, 6-2-10 through 6-2-13, 6-2-2, 6-3-1 through 6-3-4, 3-4-1, 3-4-3, and TM 55-1520-248-23, tasks 1-4-5 and 4-4-2. Replace scavenge oil filter element, TM 55-1520-2480-23, tasks 4-4-17 and 1-4-5.1.

RGF-15 Oil temperature exceeds 107 Degrees C. (225 Deg. F). Page 1 of 2

THIS MAY BE CAUSED BY: Oil temperature measurement system. Aircraft oil cooler, cooler bypass, or thermostat. Cooling fan damaged or obstructed.



RGF-16A

Run engine for ten minutes at "light on skids" power.
Reinspect/clean:
Oil filter, TM 55-2840-256-23, tasks 6-2-9 through 6-2-13.
Magnetic chip detectors, tasks 6-3-1 through 6-3-4.
If carbon particles found in oil filter, service power turbine pressure oil fitting, screen, and nozzle, TM 55-2840-256-23, task 1-8-4.
Measure oil flow from scavenge oil strut, task 1-8-9.

Return to service.
NOTE: Reinspection of oil filter and magnetic chip detectors is required after five hours of operation.

Carbon particles found on reinspection?

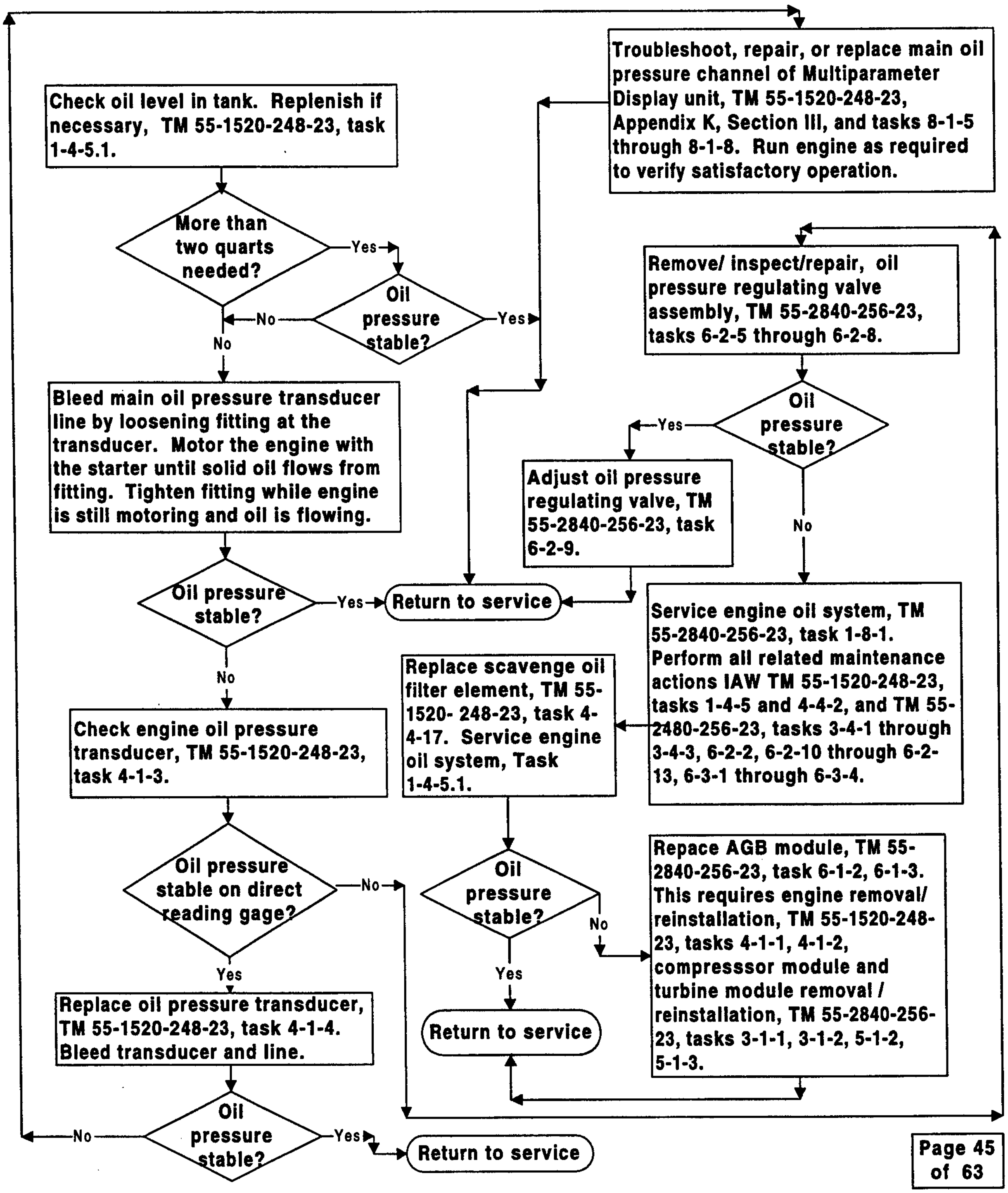
No → Return to sevice

Yes

Service power turbine pressure oil fitting, screen and nozzle, TM 55-2840-256-23, task 1-8-4. Service power turbine scavenge strut, TM 55-2840-256-23, task 1-8-6. Measure oil flow from scavenge strut, task 1-8-9.

Return to sevice

THIS MAY BE CAUSED BY: Oil level. Pressure measurement system. Oil pressure regulator. Air in pressure sensing lines. Oil foaming. Aircraft oil system. Flow restriction. Oil pump.



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RGF-17 ENGINE OIL TANK FILLS DURING FLIGHT AS TRANSMISSION OIL LEVEL DECREASES.

THIS CAN ONLY RESULT FROM TRANSFER OF OIL FROM THE AIRCRAFT TRANSMISSION OIL SYSTEM TO THE ENGINE OIL SYSTEM THROUGH LEAKING SEALS AT THE AGB FRONT OR REAR (MAIN ROTOR AND TAIL ROTOR DRIVE), POWER OUTPUT LOCATIONS.

Transfer of oil from the aircraft transmission oil system to the engine oil system can occur at the interface between the engine AGB front output drive and the free wheeling unit (FWU) or at the rear AGB power takeoff (tail rotor drive shaft aft bearing and seal cap). The engine and transmission oil systems are isolated from each other by lip seals at the AGB front and rear output drives. Seal leakage or inadequate scavenging of the FWU can allow entry of transmission oil into the engine oil system.

Inspect the oil return line from the FWU to the transmission for sharp bends, kinks, or obstructions that could restrict scavenge oil flow from the FWU. Repair or replace as necessary.

Repair necessary?

Yes → Service engine oil system (below).

No → Replace front and rear AGB output drive seals, TM 55-2840-256-23, task 6-1-4. This requires removal/reinstallation of the free wheeling unit, TM 55-1520-248-23, task 6-5-1, engine to transmission drive shaft, task 6-2-2, and forward tail rotor drive shaft, task 6-6-1.

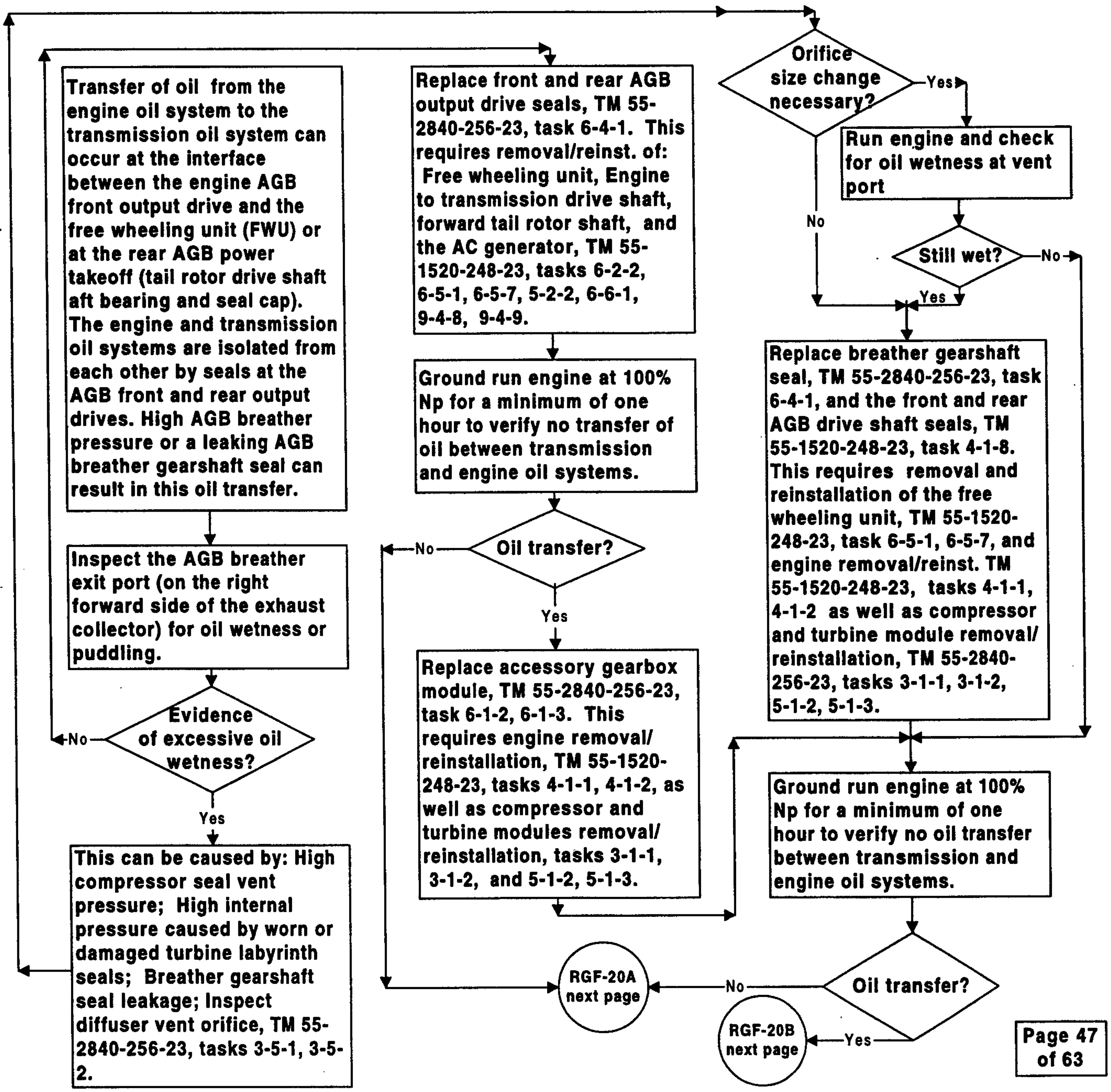
Service engine oil system, TM 55-2840-256-23, task 1-4-5. PERFORM ALL RELATED MAINTENANCE REQUIREMENTS FOR: OIL TANK, OIL FILTER, OIL FILTER HOUSING, CHIP DETECTORS, OIL PRESSSURE TRANSDUCER, TM 55-2840-256-23, tasks 1-4-5 and 4-4-2, and TM 55-1520-248-23, tasks 6-2-2, 6-2-10 through 6-2-13, 6-3-1 through 6-3-4, 3-4-1 through 3-4-3. FLUSH AIRCRAFT OIL LINES AND OIL COOLER. Replace scavenge oil filter element, TM 55-1520-248-23, task 4-4-17. Service engine oil system, task 1-4-5.1.

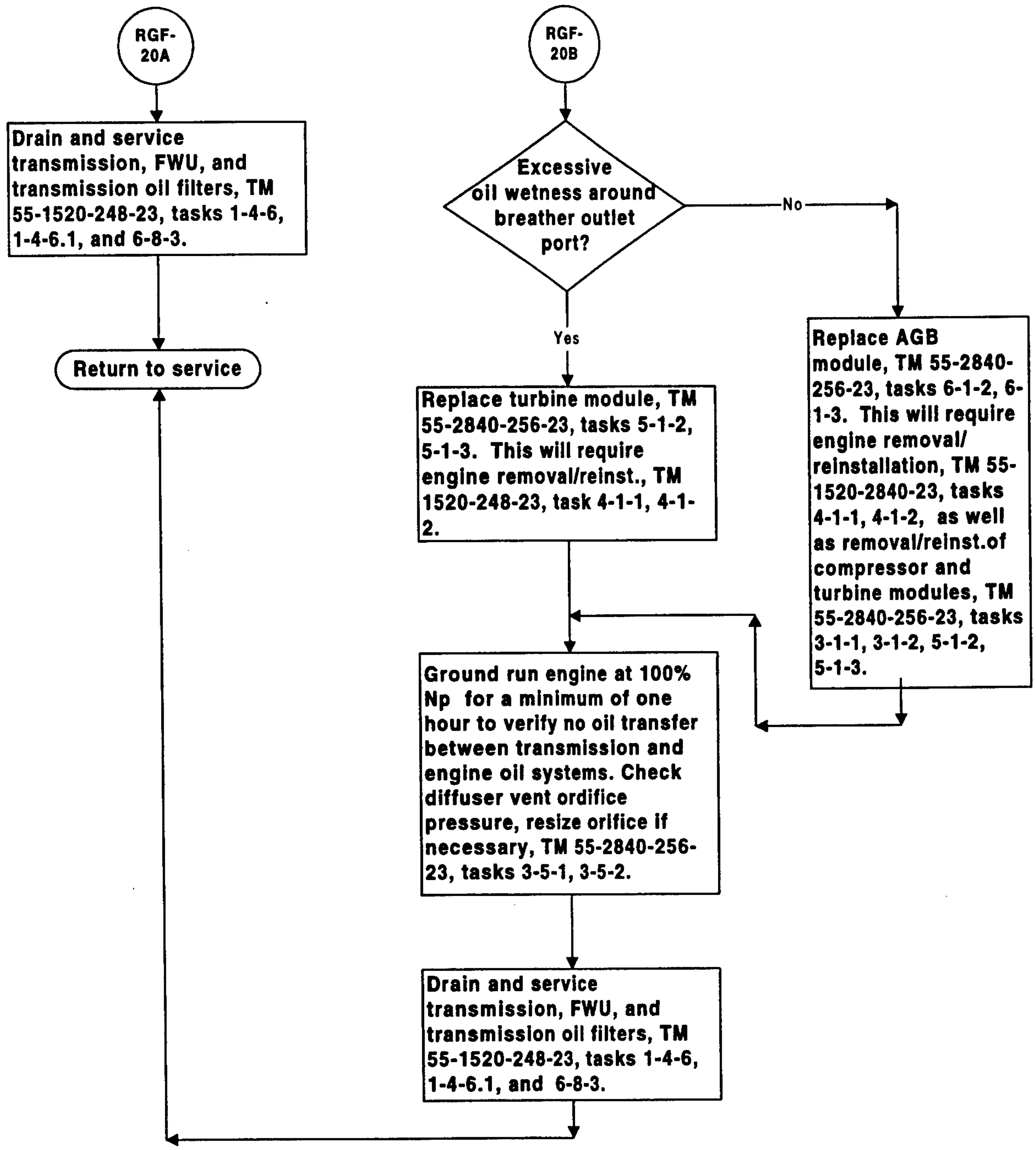
Ground run the engine for at least one hour at 100% Np to verify no transfer of oil between the transmission and engine.

Return to service

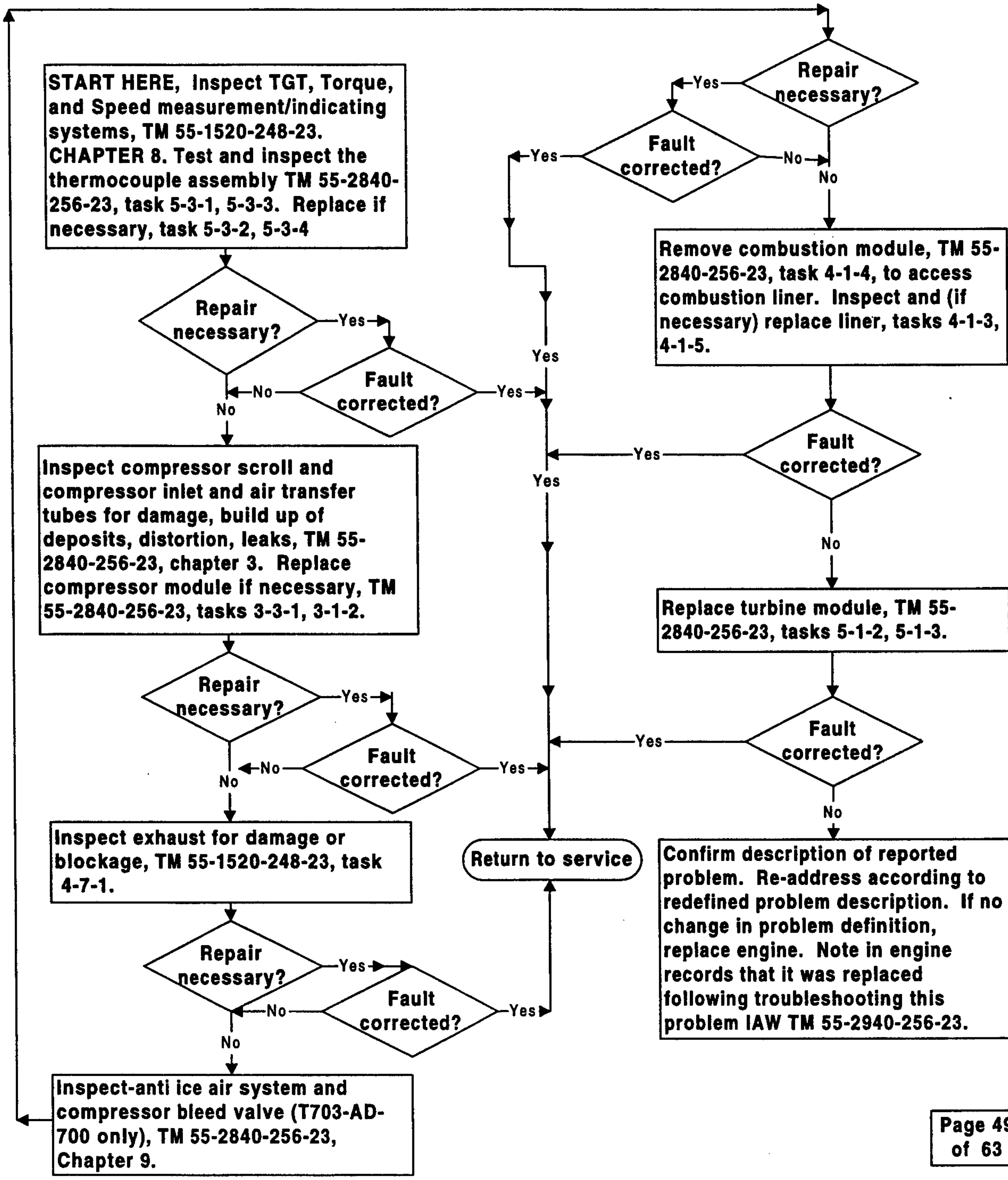
RGF-18 TRANSMISSION OIL LEVEL INCREASES DURING FLIGHT AS ENGINE OIL TANK EMPTIES. Page 1 of 2

THIS CAN ONLY RESULT FROM TRANSFER OF OIL FROM THE ENGINE OIL SYSTEM TO TRANSMISSION OIL SYSTEM THROUGH OIL BEING FORCED, OR LEAKING, THROUGH THE SEALS AT THE AGB FRONT OR REAR (MAIN ROTOR AND TAIL ROTOR DRIVE) POWER OUTPUT LOCATIONS.



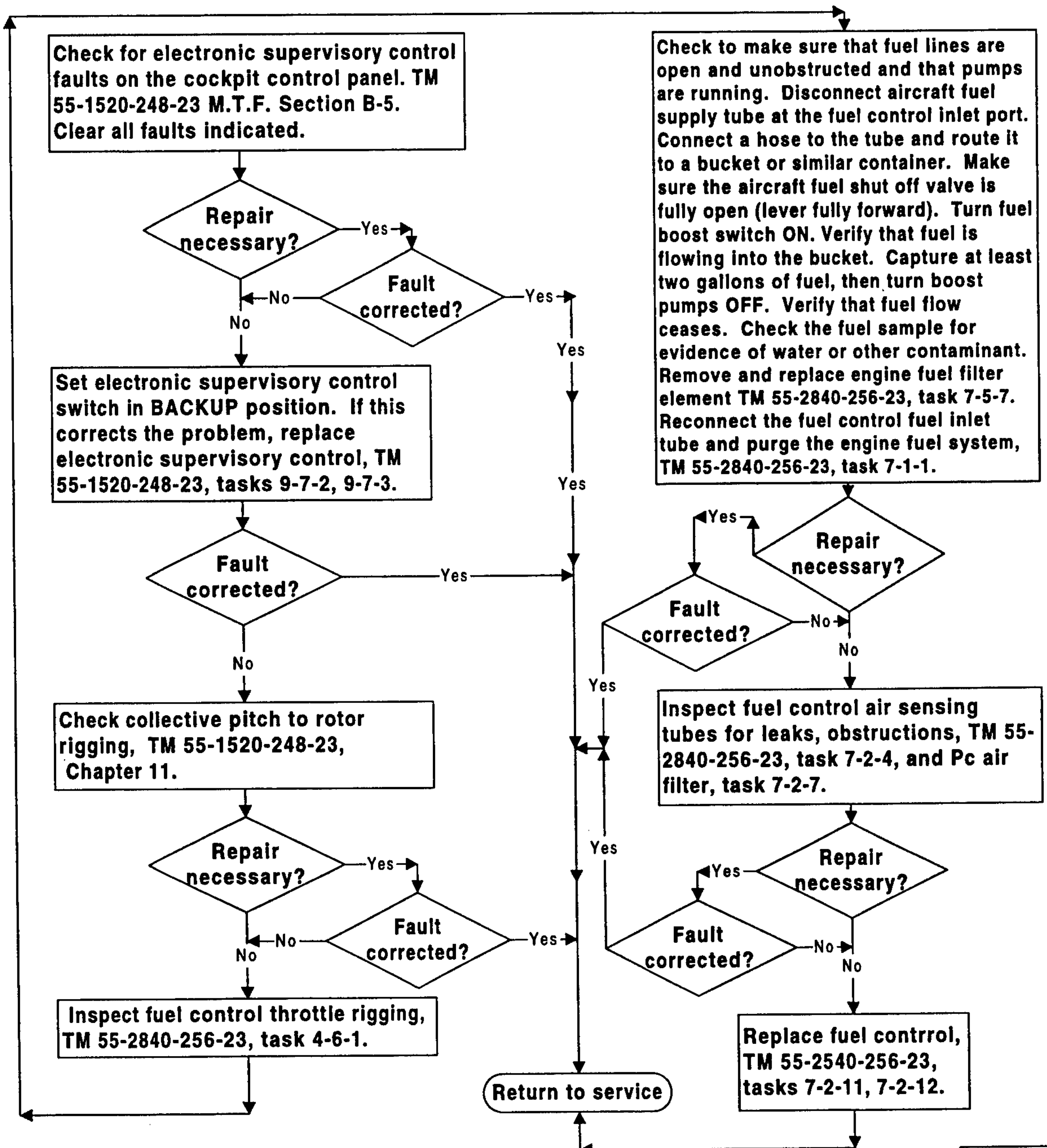

RGF-20A
Drain and service transmission, FWU, and transmission oil filters, TM 55-1520-248-23, tasks 1-4-6, 1-4-6.1, and 6-8-3.
Return to service
RGF-20B
Excessive oil wetness around breather outlet port?
No
Yes
Replace turbine module, TM 55-2840-256-23, tasks 5-1-2, 5-1-3. This will require engine removal/reinst., TM 1520-248-23, task 4-1-1, 4-1-2.
Replace AGB module, TM 55-2840-256-23, tasks 6-1-2, 6-1-3. This will require engine removal/ reinstallation, TM 55-1520-2840-23, tasks 4-1-1, 4-1-2, as well as removal/reinst.of compressor and turbine modules, TM 55-2840-256-23, tasks 3-1-1, 3-1-2, 5-1-2, 5-1-3.
Ground run engine at 100% Np for a minimum of one hour to verify no oil transfer between transmission and engine oil systems. Check diffuser vent ordifice pressure, resize orifice if necessary, TM 55-2840-256-23, tasks 3-5-1, 3-5-2.
Drain and service transmission, FWU, and transmission oil filters, TM 55-1520-248-23, tasks 1-4-6, 1-4-6.1, and 6-8-3.

THIS MAY BE CAUSED BY: Ng, Torque, or Np measuring systems. Dirty or degraded/ damaged compressor. Degraded turbine. Blocked or distorted compressor inlet. Blocked exhaust. Anti-icing system on or leaking. External air leaks. Accessory bleed open. Degraded combustor. No. 6 and 7 area labyrinth seals having excessive clearance.



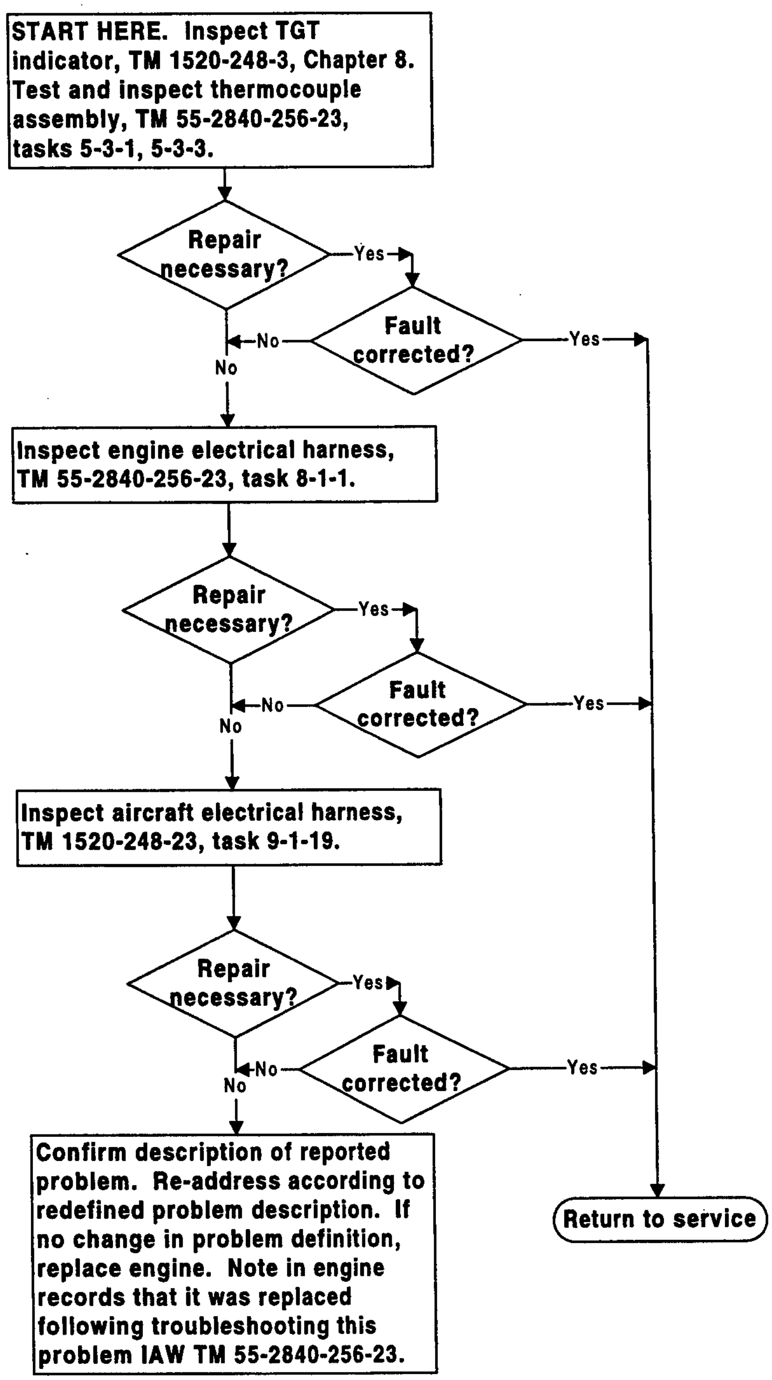
RF-2 LOW POWER WITH TGT BELOW MAXIMUM LIMIT. Page 1 of 1

THIS CAN BE CAUSED BY: Fuel control throttle lever not at the maximum stop. Collective pitch to rotor rigging. Restriction in fuel supply. Low inlet pressure to the fuel pump. Dirty fuel filter. Pneumatic leak in fuel control air sensing tubes. Clogged Pc air filter or air sensing tube. Improperly shimmed or blocked fuel nozzle. Fuel control malfunction. Electronic supervisory control.



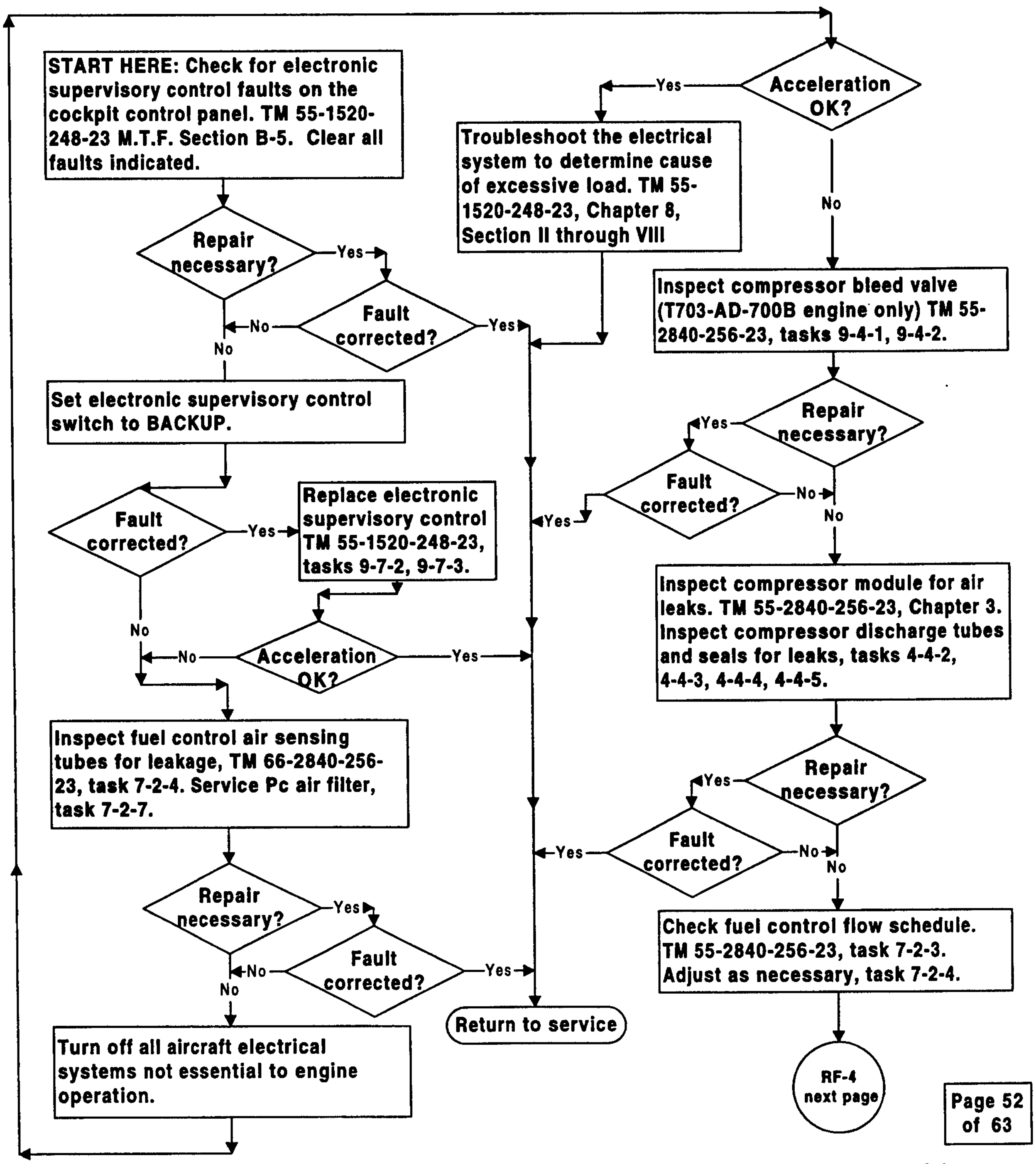
RF-3 LOW MEASURED TGT AT NORMAL OR HIGH POWER. Page 1 of 1

THIS CAN BE CAUSED BY: TGT indicator, thermocouple, or harness. Engine electrical harness. Aircraft electrical harness. NOTE: IF THE ENGINE IS PRODUCING NORMAL POWER, THE FUEL CONTROL SYSTEM CANNOT CAUSE A TGT ERROR.



RF-4 SLOW TO ACCELERATE TO POWER - ROTOR DROOP WITH COLLECTIVE PITCH INCREASE. Page 1 of 2

THIS CAN BE CAUSED BY: Pneumatic leak in fuel control air sensing tubes. Excessive generator load. Bleed valve stuck open (T703-AD 700B engine only). Excessive compressor air leakage. Fuel control. Electronic supervisory control.



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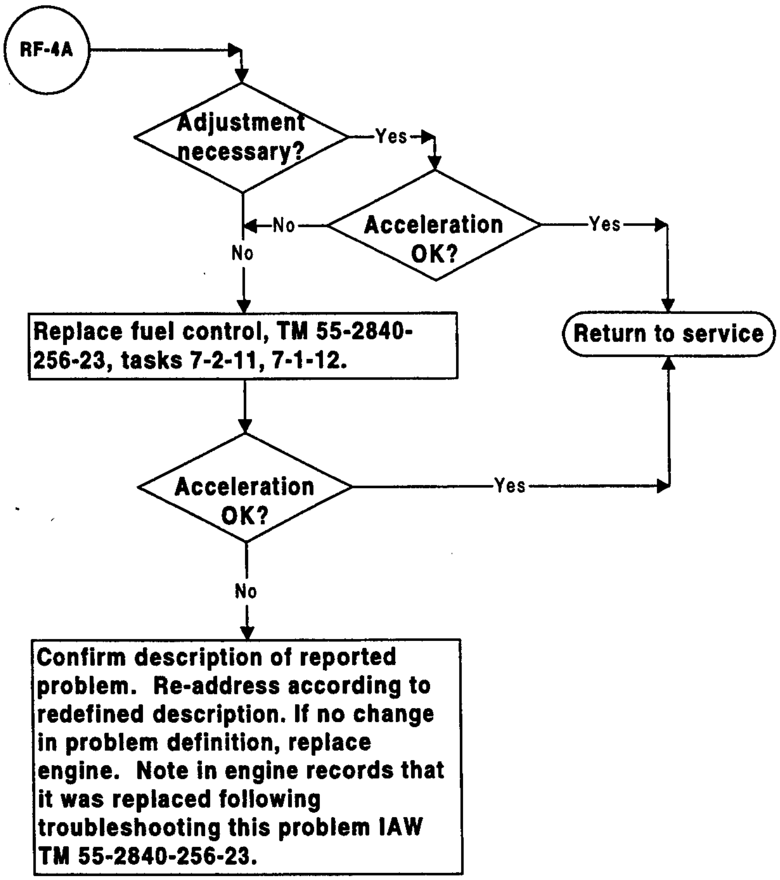

RF-4A
Adjustment necessary?
Yes
No
Acceleration OK?
No
Yes
Replace fuel control, TM 55-2840-256-23, tasks 7-2-11, 7-1-12.
Return to service
Acceleration OK?
Yes
No
Confirm description of reported problem. Re-address according to redefined description. If no change in problem definition, replace engine. Note in engine records that it was replaced following troubleshooting this problem IAW TM 55-2840-256-23.

RF-5 OIL CONSUMPTION EXCEEDS ONE QUART PER FIVE HOURS OF ENGINE OPERATION. Page 1 of 2

THIS MAY BE CAUSED BY: External leak, engine or aircraft. AGB lip seal leak. No. 1 seal leak. Turbine sump scavenge strut blockage or inadequate scavenging. High AGB case pressure. No. 5 labyrinth seal leak. Dirty scavenge filter.

Visually inspect the engine oil system and drains for evidence of leakage or venting.

Leakage or drainage noted?

Yes

Tighten loose tube fittings, hose fittings, etc, as necessary. Repair or replace components as necessary: OIL TANK, TM 55-1520-248-23, tasks 4-4-1 through 4-4-8. OIL COOLER BYPASS VALVE, task 4-4-9. OIL SCAVENGE FILTER: task 4-4-18. ACCESSORY DRIVE LIP SEALS, TM 55-2840-256-23, task 6-4-1. STARTER GENERATOR, TM 55-1520-248-23, task 9-3-15, OUTPUT DRIVE LIP SEALS, TM 55-1520-248-23, task 4-1-9. Run engine to verify leakage corrected.

Return to service

No

Inspect the exhaust collector flow path for the following

Compressor diffuser vent leaking?

Yes

Inspect, (resize if necessary) diffuser vent orifice, TM 55-2840-256-23, tasks 3-5-1, 3-5-2.

No

Gearbox breather vent leaking?

Yes

Replace breather gearshaft lip seal, TM 55-2840-256-23, task 6-1-4. This requires removal/ reinstallation of the engine, TM 55-1520-248-23, tasks 4-1-1, 4-1-2, compressor module removal/ reinstallation, TM 55-2840-256-23, tasks 3-1-1, 3-1-2, and turbine module removal/reinstallation, tasks 5-1-2, 5-1-3. Run engine to verify leakage has stopped.

No

No. 5 labryrinth seal leaking?

No

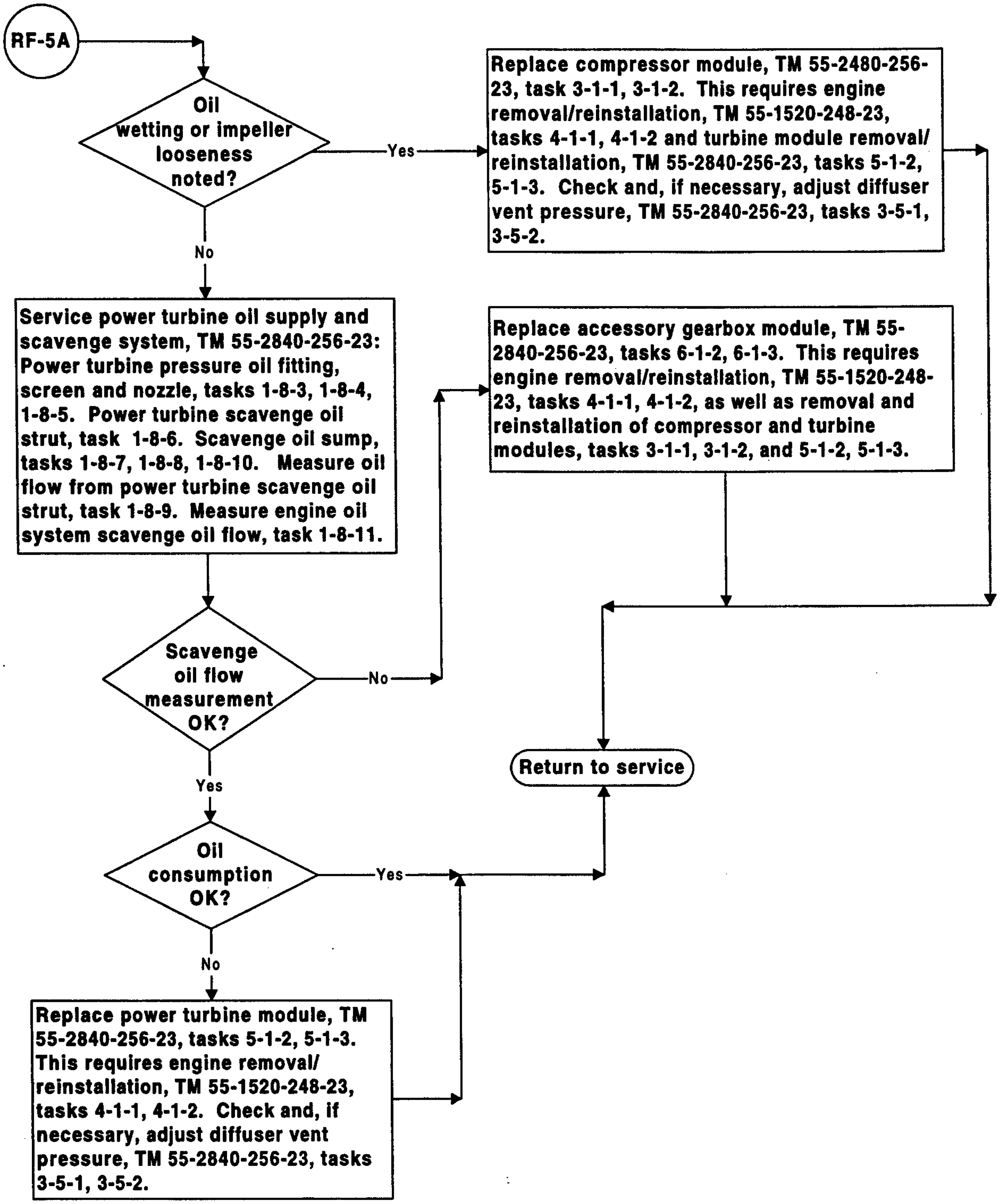
Remove air induction cowling, TM 55-1520-248-23, task 4-2-1. Inspect compressor inlet for oil wetting of impeller or on inside of shroud. Inspect the inlet for looseness of impeller at No. 1 bearing area for damage to inlet guide vanes or impeller vanes, or for rub or erosion of shroud lining in vicinity of impeller vane tips.

RF-5A next page

Yes

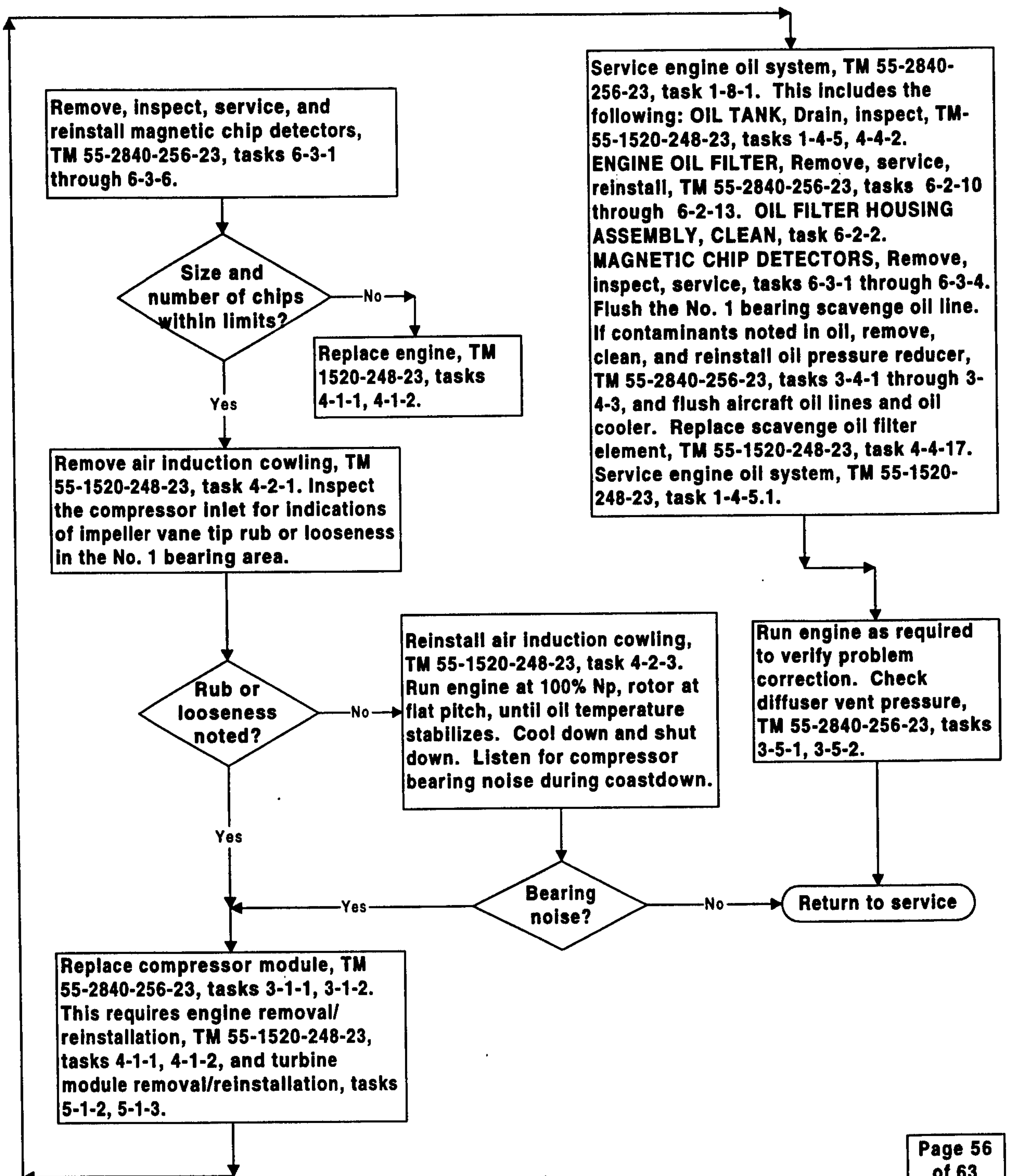
Replace turbine module, TM 55-2840-256-23, tasks 5-1-2, 5-1-3. This requires engine removal/ reinstallation, TM 55-1520-248-23, tasks 4-1-1, 4-1-2. Check and adjust, if necessary, diffuser vent orifice, TM 55-2840-256-23, tasks 3-5-1, 3-5-2.

Return to service


RF-5A
Oil wetting or impeller looseness noted?
Yes
Replace compressor module, TM 55-2480-256-23, task 3-1-1, 3-1-2. This requires engine removal/reinstallation, TM 55-1520-248-23, tasks 4-1-1, 4-1-2 and turbine module removal/reinstallation, TM 55-2840-256-23, tasks 5-1-2, 5-1-3. Check and, if necessary, adjust diffuser vent pressure, TM 55-2840-256-23, tasks 3-5-1, 3-5-2.
No
Service power turbine oil supply and scavenge system, TM 55-2840-256-23: Power turbine pressure oil fitting, screen and nozzle, tasks 1-8-3, 1-8-4, 1-8-5. Power turbine scavenge oil strut, task 1-8-6. Scavenge oil sump, tasks 1-8-7, 1-8-8, 1-8-10. Measure oil flow from power turbine scavenge oil strut, task 1-8-9. Measure engine oil system scavenge oil flow, task 1-8-11.
Replace accessory gearbox module, TM 55-2840-256-23, tasks 6-1-2, 6-1-3. This requires engine removal/reinstallation, TM 55-1520-248-23, tasks 4-1-1, 4-1-2, as well as removal and reinstallation of compressor and turbine modules, tasks 3-1-1, 3-1-2, and 5-1-2, 5-1-3.
Scavenge oil flow measurement OK?
No
Return to service
Yes
Oil consumption OK?
Yes
No
Replace power turbine module, TM 55-2840-256-23, tasks 5-1-2, 5-1-3. This requires engine removal/reinstallation, TM 55-1520-248-23, tasks 4-1-1, 4-1-2. Check and, if necessary, adjust diffuser vent pressure, TM 55-2840-256-23, tasks 3-5-1, 3-5-2.

OFF-1 BEARING NOISE AT COMPRESSOR WHICH MAY BE ACCOMPANIED BY LOOSENESS OF THE IMPELLER. Page 1 of 1

THIS IS AN INDICATION OF A BEARING FAILURE.



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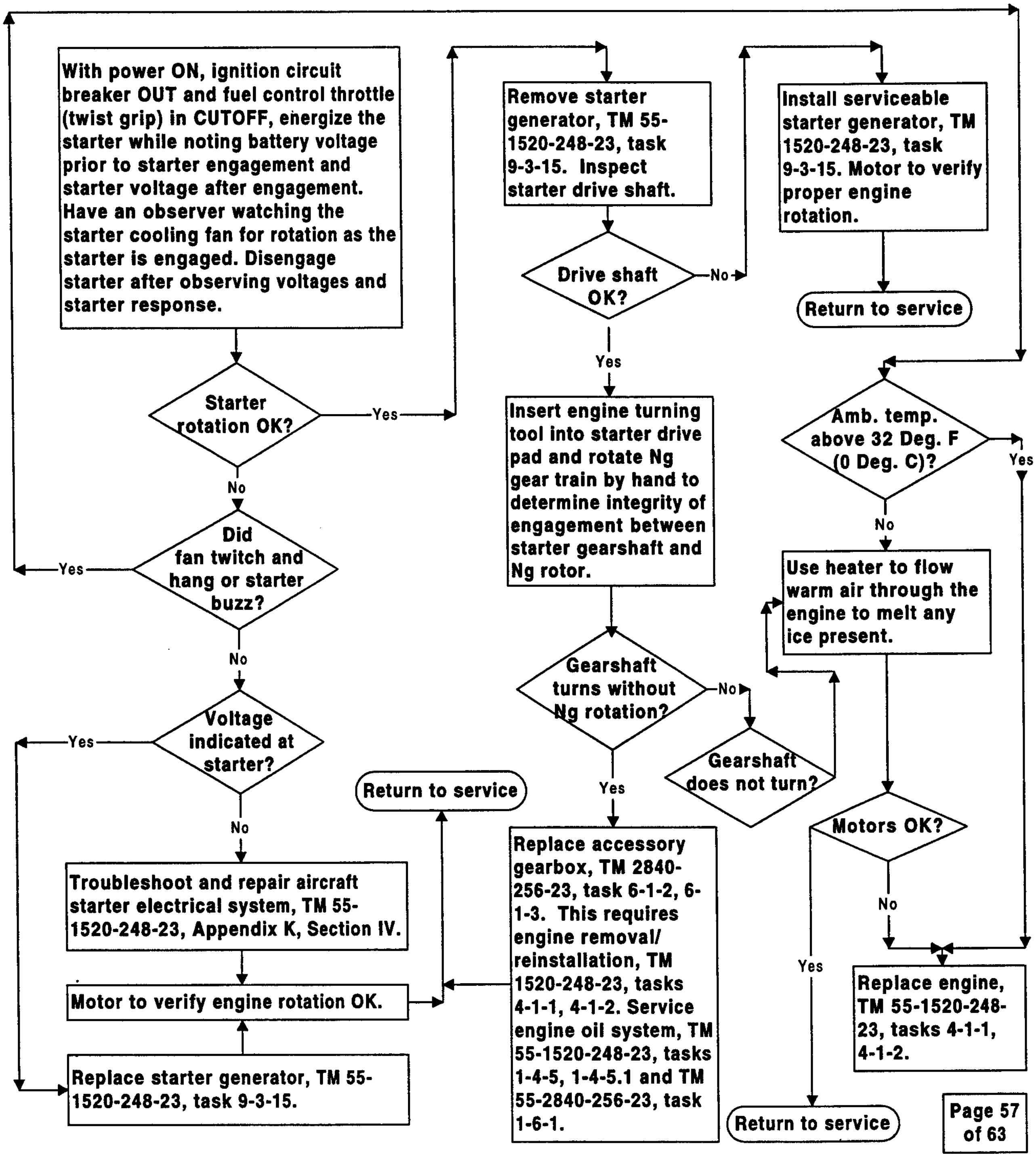
OFF-2 ENGINE WILL NOT CRANK (STARTER UNABLE TO ROTATE ENGINE).

THIS MAY BE CAUSED BY: Insufficient voltage to the starter. Electrically failed or defective starter-generator. Binding of Compressor, Turbine, or Gearbox.



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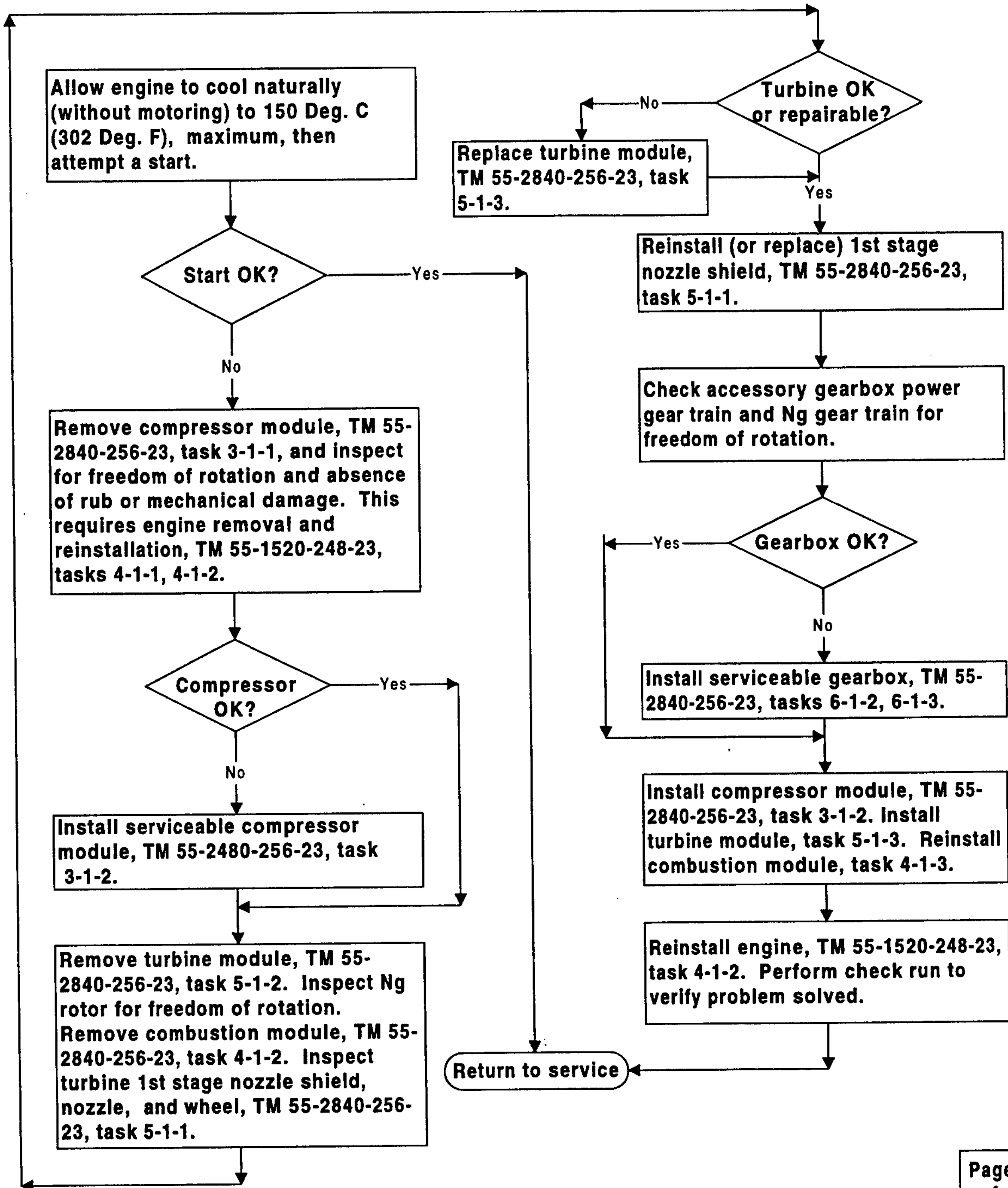
OFF-3 STARTER WILL NOT ROTATE ENGINE IMMEDIATELY AFTER SHUT DOWN.

Rub or binding of rotating components due to differential rate of cooling, or insufficient clearance.



OFF-4 STATIC OIL LEAKAGE FROM POWER AND ACCESSORY GEARBOX BREATHER.

THIS IS AN INDICATION THAT THE OIL FILTER CHECK VALVE IS LEAKING.

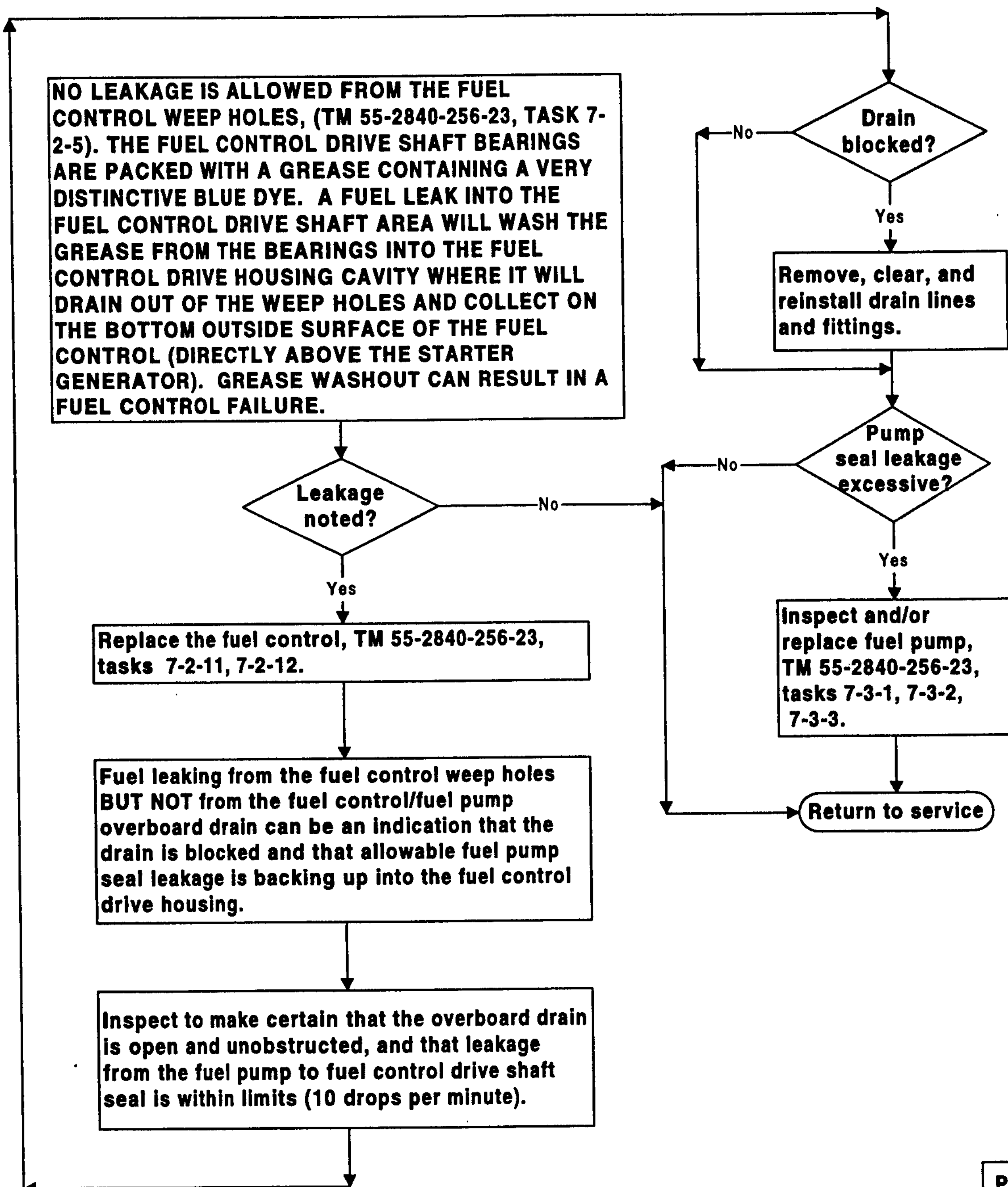
Remove the oil filter housing and check valve assembly. Replace the check valve and reinstall the oil filter housing and check valve assembly, TM 55-2840-256-23, tasks 6-2-3 and 6-2-4.

↓

Return to service

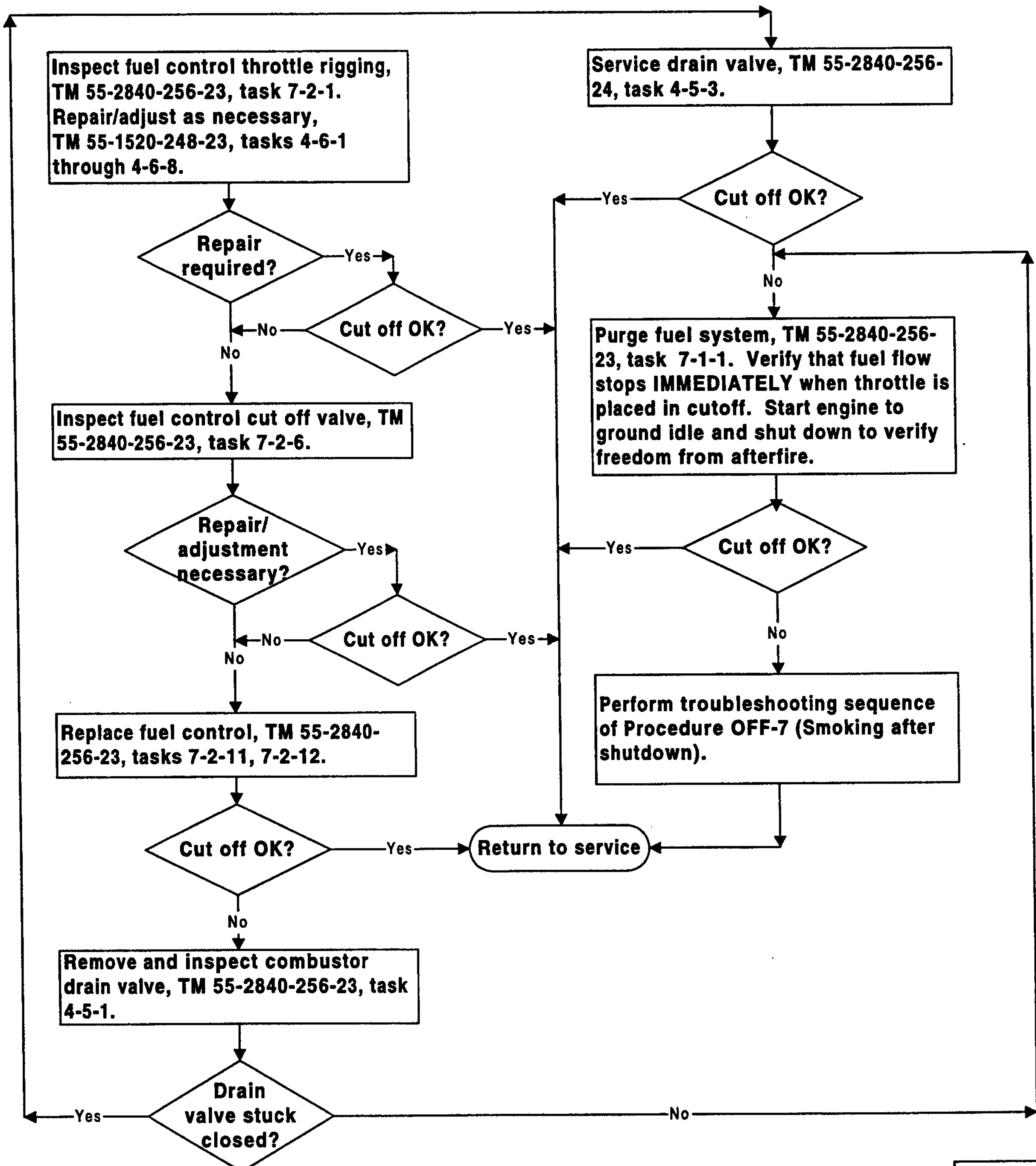
OFF-5 FUEL LEAKING FROM THE FUEL CONTROL SEEP HOLES. LEAKAGE MAY BE BLUE IN COLOR AND/OR BLUE STAIN MAY BE FOUND ON THE LOWER EXTERNAL SURFACE OF THE FUEL CONTROL.

THIS IS AN INDICATION OF A LEAKING FUEL PUMP DRIVE SHAFT SEAL, OR FUEL PUMP DRIVE O-RING LEAK.



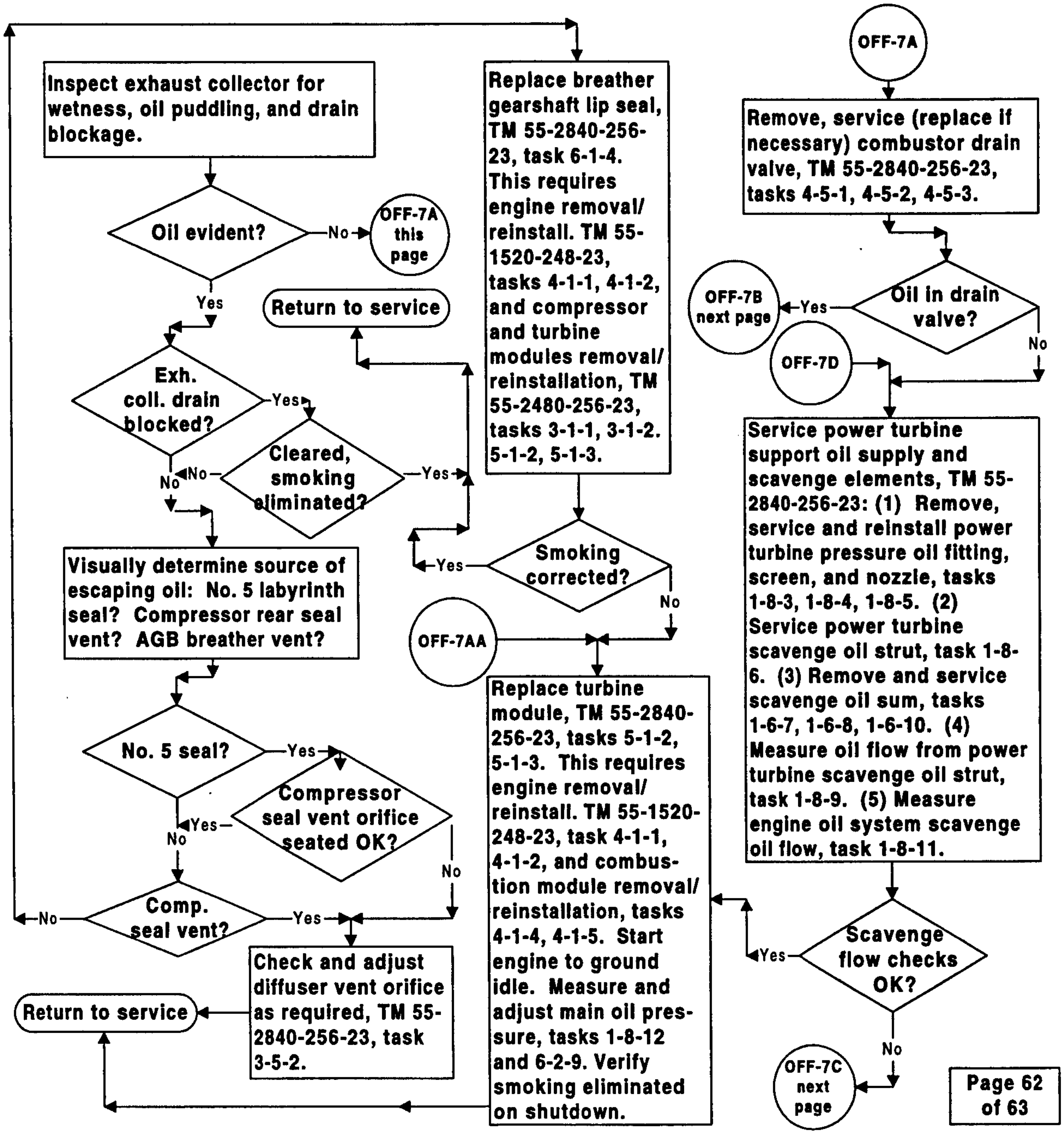
OFF-6 AFTERFIRE. TGT INCREASE AFTER ENGINE SHUTDOWN INDICATING RESIDUAL FIRE IN THE COMBUSTOR. **Page 1 of 1**

THIS CAN BE CAUSED BY: Fuel control cut off valve not fully closed. Oil leak. Sticking burner drain valve. Burner drain valve line obstruction.



OFF-7 SMOKING DURING OR IMMEDIATELY FOLLOWING ENGINE SHUT DOWN. (LIGHT WISPS OF SMOKE CAN BE NORMAL AND ARE NOT CAUSE FOR MAINTENANCE ACTION UNLESS OIL CONSUMPTION LIMITS ARE EXCEEDED.)

THIS MAY BE CAUSED BY: Exhaust collector drain restricted. Combustor drain restricted. Blocked power turbine scavenge strut. Aircraft system scavenge flow restricted. Scavenge flow from turbine restricted. Defective turbine seals. Leaking oil transfer tubes or check valve. Defective oil pump.



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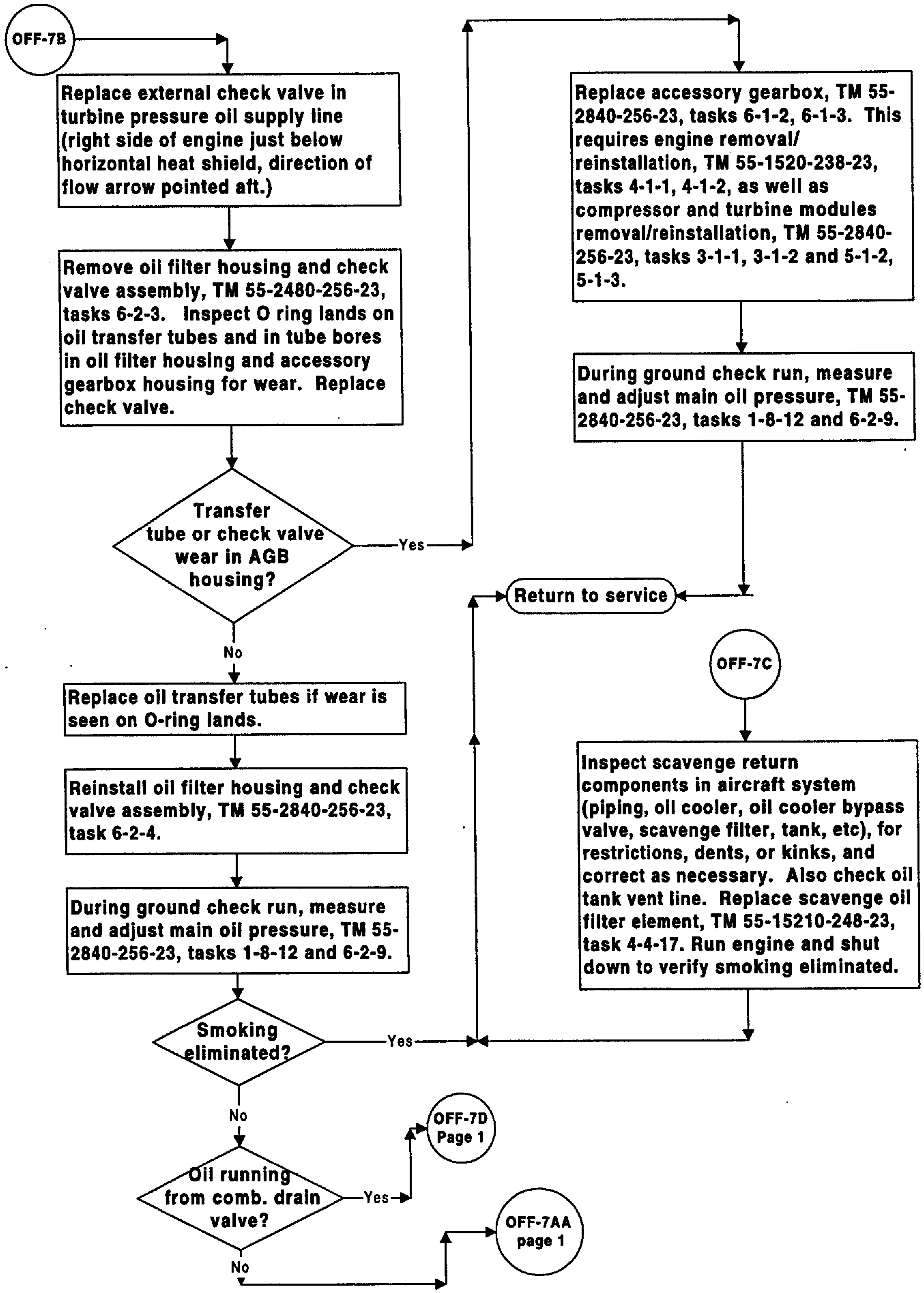

OFF-7B
Replace external check valve in turbine pressure oil supply line (right side of engine just below horizontal heat shield, direction of flow arrow pointed aft.)
Remove oil filter housing and check valve assembly, TM 55-2480-256-23, tasks 6-2-3. Inspect O ring lands on oil transfer tubes and in tube bores in oil filter housing and accessory gearbox housing for wear. Replace check valve.
Transfer tube or check valve wear in AGB housing?
Yes
No
Replace oil transfer tubes if wear is seen on O-ring lands.
Reinstall oil filter housing and check valve assembly, TM 55-2840-256-23, task 6-2-4.
During ground check run, measure and adjust main oil pressure, TM 55-2840-256-23, tasks 1-8-12 and 6-2-9.
Smoking eliminated?
Yes
No
Oil running from comb. drain valve?
Yes
No
OFF-7D Page 1
OFF-7AA page 1
Replace accessory gearbox, TM 55-2840-256-23, tasks 6-1-2, 6-1-3. This requires engine removal/ reinstallation, TM 55-1520-238-23, tasks 4-1-1, 4-1-2, as well as compressor and turbine modules removal/reinstallation, TM 55-2840-256-23, tasks 3-1-1, 3-1-2 and 5-1-2, 5-1-3.
During ground check run, measure and adjust main oil pressure, TM 55-2840-256-23, tasks 1-8-12 and 6-2-9.
Return to service
OFF-7C
Inspect scavenge return components in aircraft system (piping, oil cooler, oil cooler bypass valve, scavenge filter, tank, etc), for restrictions, dents, or kinks, and correct as necessary. Also check oil tank vent line. Replace scavenge oil filter element, TM 55-15210-248-23, task 4-4-17. Run engine and shut down to verify smoking eliminated.

Appendix B

Model 250-C30R/3 Basic Engine Fault Isolation and Correction Visio Charts

51 Procedures (146 pages)

St-1 intentionally omitted.

St-2. Compressor Surges During Starts

There are several causes of compressor surge during engine starting, among which are:

- ECU fault
- HMU fault
- Compressor inlet thermal distortion (exhaust gas ingestion)
- Compressor inlet blockage or pressure distortion
- Compressor inducer bleed duct blockage or hose disconnection
- Compressor contamination, damage or erosion
- Turbine blockage or damage

If surges during starting are encountered, proceed as follows:

Connect Maintenance Terminal and determine whether FADEC faults are indicated. If so, perform maintenance actions as required to clear. If the ECU and/or HMU were replaced as a result of clearing these faults, attempt a start and determine whether the surge problem still exists.

Were ECU or HMU replaced? — No → Verify surging was not result of exhaust gas ingestion; Yes → Was subsequent start OK?

Was subsequent start OK? — Yes → **Return to service**; No → Verify surging was not result of exhaust gas ingestion

Verify surging was not result of exhaust gas ingestion, by heading aircraft into wind during starting (if it had been positioned with tail into wind when surging occurred). If so, attempt a start.

Had aircraft been positioned tail to wind? — Yes → Did repositioning eliminate surging?; No → Visually inspect compressor air inlet

Did repositioning eliminate surging? — Yes → **Return to service**; No → Visually inspect compressor air inlet

Visually inspect compressor air inlet for blockage, by viewing through inlet plenum observation window.

Compressor inlet blockage noted? — No → St-2 A (Pg 2); Yes → (below)

- Remove engine IAW similar to TM55-1520-248-23, Task 4-1-1.
- Remove and **replace compressor module** IAW TM1-2840-263-23, 72-50-00, para. 1-A and 1.B. (This also requires removal and reinstallation of turbine module IAW TM1-2840-263-23, 72-50-00, para. 1-A and 1.B.)
- Identify replaced compressor module as having been subjected to inlet blockage and send to overhaul.
- Determine source of object obstructing compressor inlet and correct condition, which may involve cleaning, inspecting, and repairing air induction cowl IAW similar to TM55-1520-248-23, Task 4-2-2.
- Reinstall engine IAW similar to TM55-1520-248-23, Task 4-1-2.
- As a part of the check runs accompanying engine installation, Task 4-1-2, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TM1-2840-263-23, , 72-00-00, para. 1.A Operating Instructions, para. 1.B. Diffuser Vent Orifice Selection

Return to service

St-2 A (Pg 2)

2 Sep 1997
Rev. A 10 Dec 1997

St-2. Compressor Surges During Starts

St-2 A

- Inspect the compressor inducer bleed hose, to verify that it is connected to the compressor shroud bleed manifold on the bottom end and, on the top end, to the attachment on the engine cowl carryoff duct.
- Check hose for kinks and cowl carryoff duct for obstructions.
- Take corrective action if any of these conditions are noted, then attempt a start and determine whether the surge problem still exists.

Diffuser bleed hose restricted or disconnected?

No

Yes

Was start OK after correcting?

No

Yes

Return to service

- Remove the air induction cowl IAW similar to TM55-1520-248-23, Task 4.2.1.
- Inspect the compressor inlet for damaged inlet guide vanes or rotor vanes, and for eroded shroud coating at the rotor vane tips.
- In addition inspect for compressor dirt deposits on the rotor vanes.

Compressor damage or erosion noted?

Yes

No

Compressor dirty and in need of cleaning?

No

Yes

- Reinstall the air induction cowl IAW similar to TM55-1520-248-23, Task 4.2.1.
- Wash the compressor IAW TM1-2840-263-23, 72-30-00, para. 4.
- Attempt a start after the drying run (if successful) and determine whether the surge problem still exists.

Was the start OK?

No

Yes

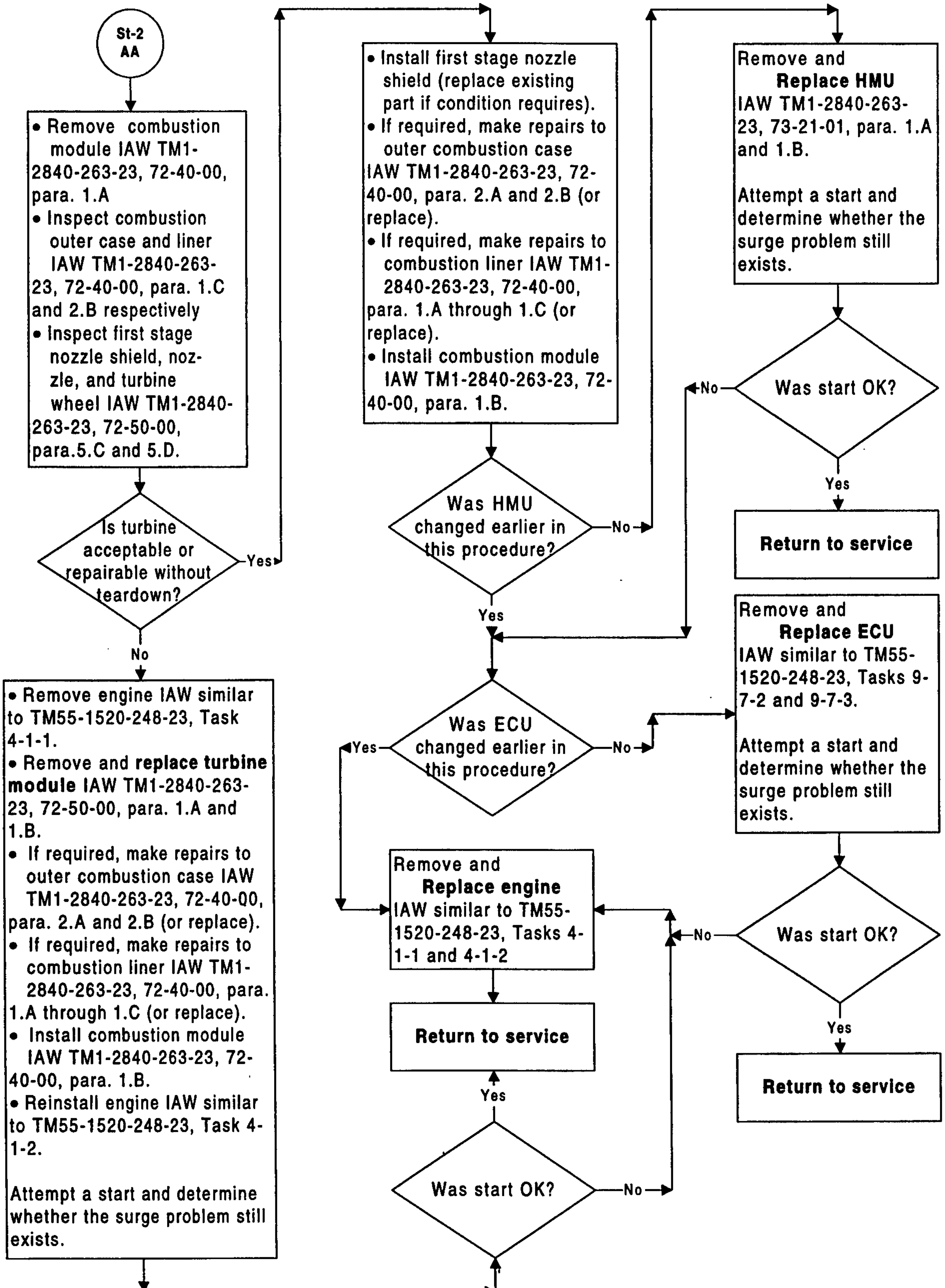
Return to service

- Remove engine IAW similar to TM55-1520-248-23, Task 4-1-1.
- Remove and **replace compressor module** IAW TM1-2840-263-23, 72-50-00, para. 1-A and 1.B (this also requires removal and reinstallation of turbine module IAW TM1-2840-263-23, 72-50-00, para. 1-A and 1.B).
- Reinstall engine IAW similar to TM55-1520-248-23, Task 4-1-2
- As a part of the check runs accompanying engine installation Task 4-1-2, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TM1-2840-263-23, , 72-00-00, para. 1.A Operating Instructions, para. 1.B. Diffuser Vent Orifice Selection

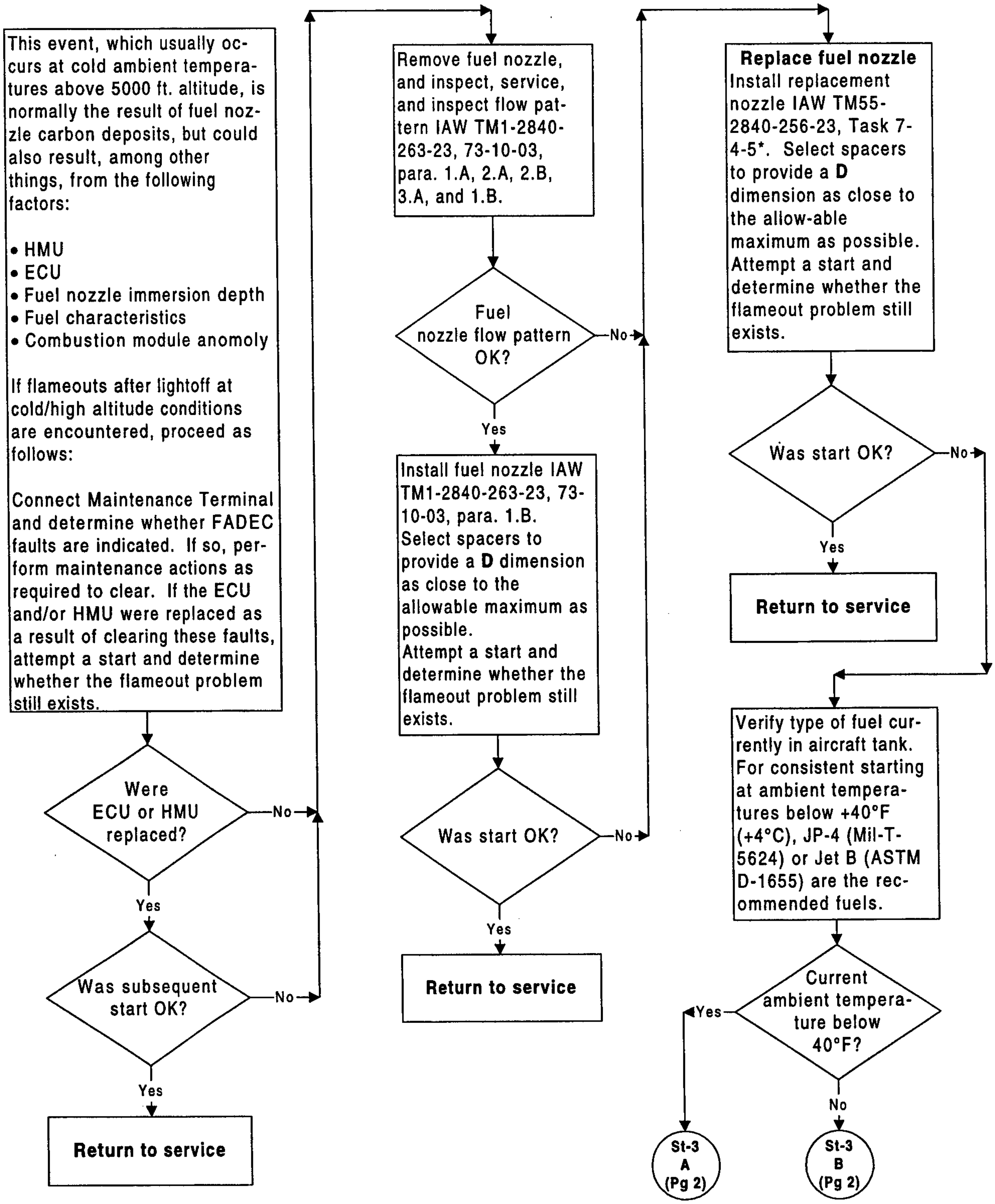
Return to service

St-2 AA (Pg 3)

2 Sep 1997
Rev. A 10 Dec 1997

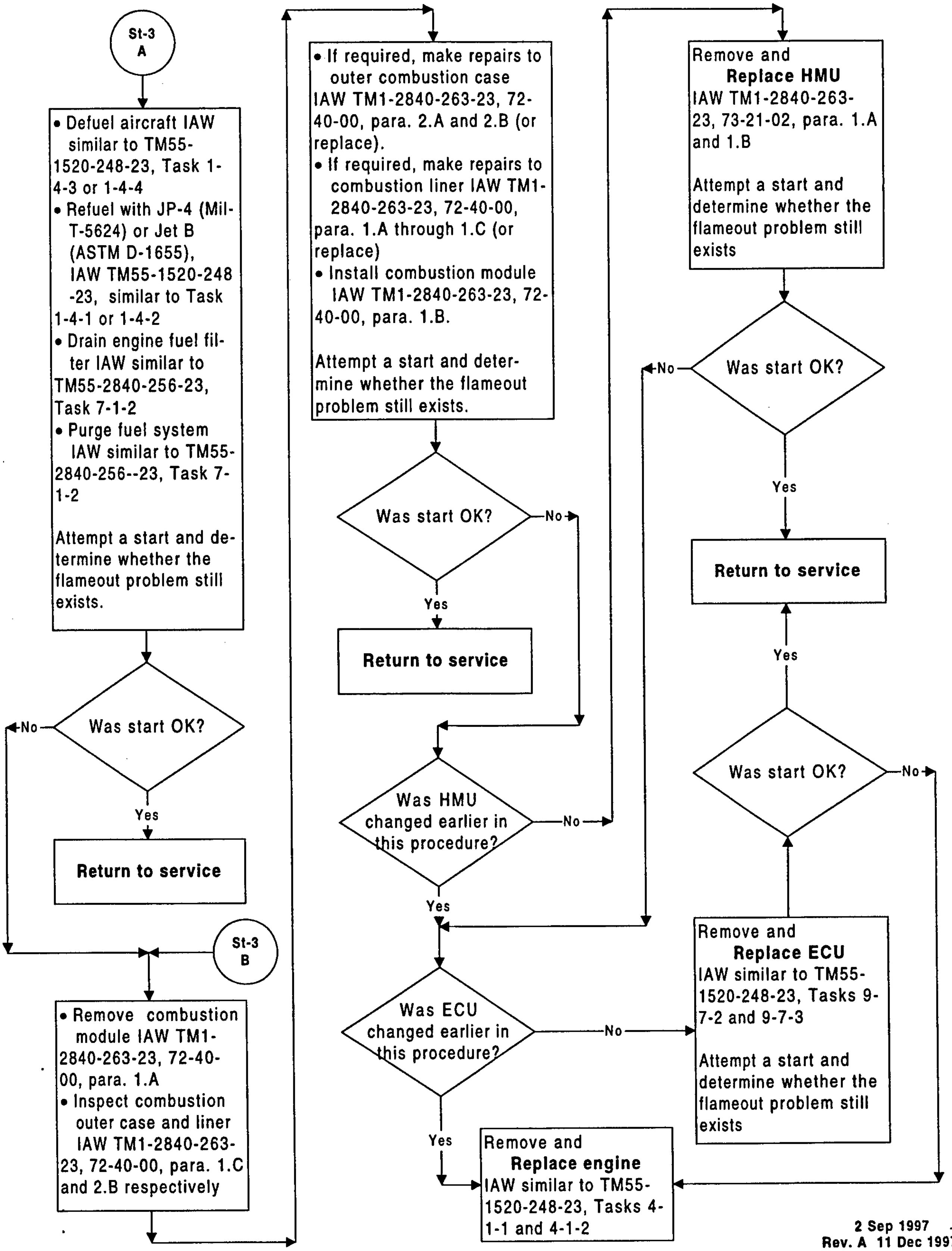

St-2 AA
• Remove combustion module IAW TM1-2840-263-23, 72-40-00, para. 1.A
• Inspect combustion outer case and liner IAW TM1-2840-263-23, 72-40-00, para. 1.C and 2.B respectively
• Inspect first stage nozzle shield, nozzle, and turbine wheel IAW TM1-2840-263-23, 72-50-00, para.5.C and 5.D.
Is turbine acceptable or repairable without teardown?
Yes
No
• Remove engine IAW similar to TM55-1520-248-23, Task 4-1-1.
• Remove and replace turbine module IAW TM1-2840-263-23, 72-50-00, para. 1.A and 1.B.
• If required, make repairs to outer combustion case IAW TM1-2840-263-23, 72-40-00, para. 2.A and 2.B (or replace).
• If required, make repairs to combustion liner IAW TM1-2840-263-23, 72-40-00, para. 1.A through 1.C (or replace).
• Install combustion module IAW TM1-2840-263-23, 72-40-00, para. 1.B.
• Reinstall engine IAW similar to TM55-1520-248-23, Task 4-1-2.
Attempt a start and determine whether the surge problem still exists.
• Install first stage nozzle shield (replace existing part if condition requires).
• If required, make repairs to outer combustion case IAW TM1-2840-263-23, 72-40-00, para. 2.A and 2.B (or replace).
• If required, make repairs to combustion liner IAW TM1-2840-263-23, 72-40-00, para. 1.A through 1.C (or replace).
• Install combustion module IAW TM1-2840-263-23, 72-40-00, para. 1.B.
Was HMU changed earlier in this procedure?
No
Yes
Was ECU changed earlier in this procedure?
Yes
No
Remove and Replace engine IAW similar to TM55-1520-248-23, Tasks 4-1-1 and 4-1-2
Return to service
Yes
Was start OK?
No
Remove and Replace HMU IAW TM1-2840-263-23, 73-21-01, para. 1.A and 1.B.
Attempt a start and determine whether the surge problem still exists.
Was start OK?
No
Yes
Return to service
Remove and Replace ECU IAW similar to TM55-1520-248-23, Tasks 9-7-2 and 9-7-3.
Attempt a start and determine whether the surge problem still exists.
Was start OK?
No
Yes
Return to service

St-3. Flames Out After Lightoff During Start Attempts At High Altitude/Cold Ambient Conditions

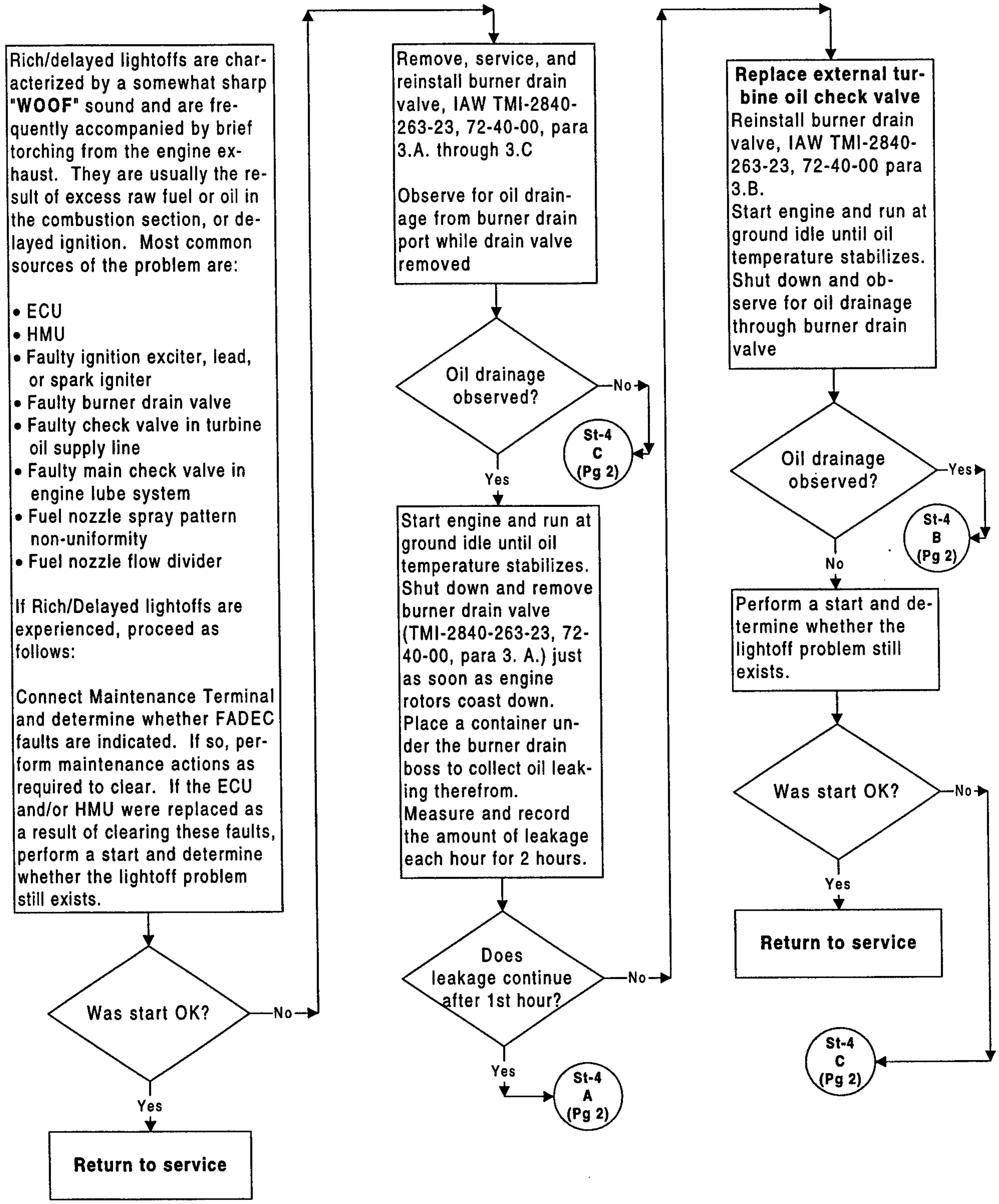


2 Sep 1997
Rev. A 11 Dec 1997

St-3. Flames Out After Lightoff During Start Attempts At High Altitude/Cold Ambient Conditions

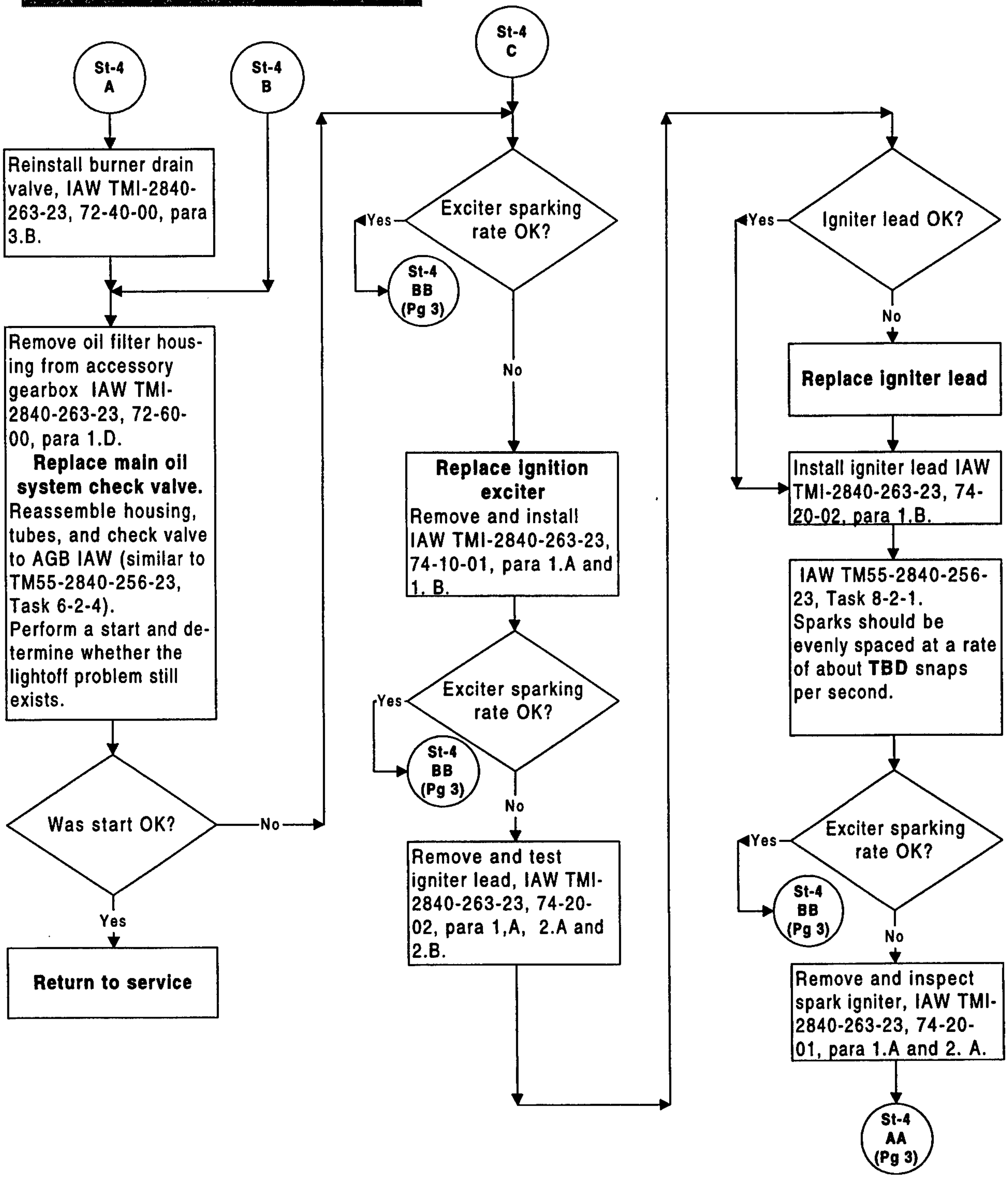


St-4. Rich/Delayed Light-off

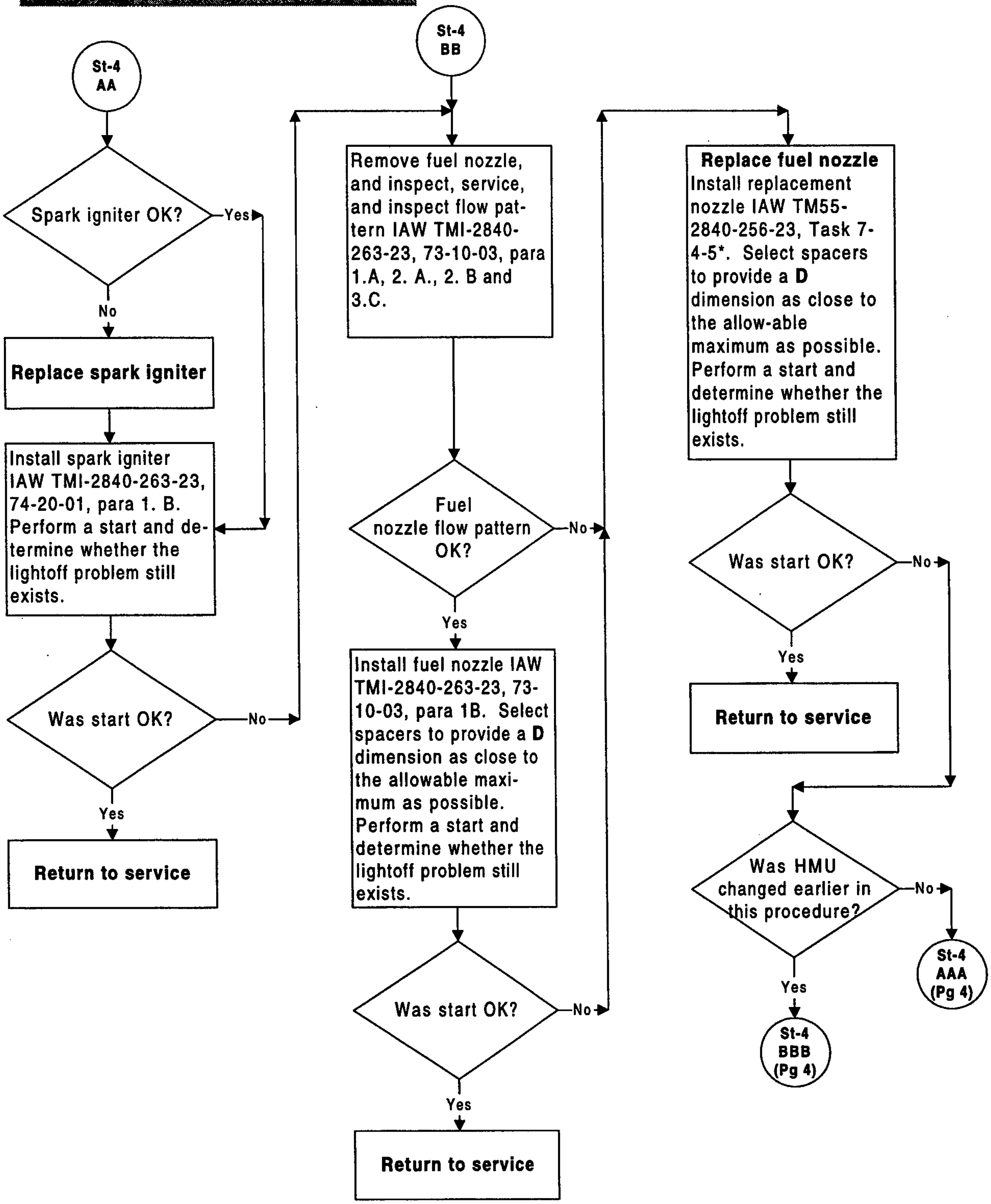


22 Sep 1997
Rev. A 22 Dec 1997

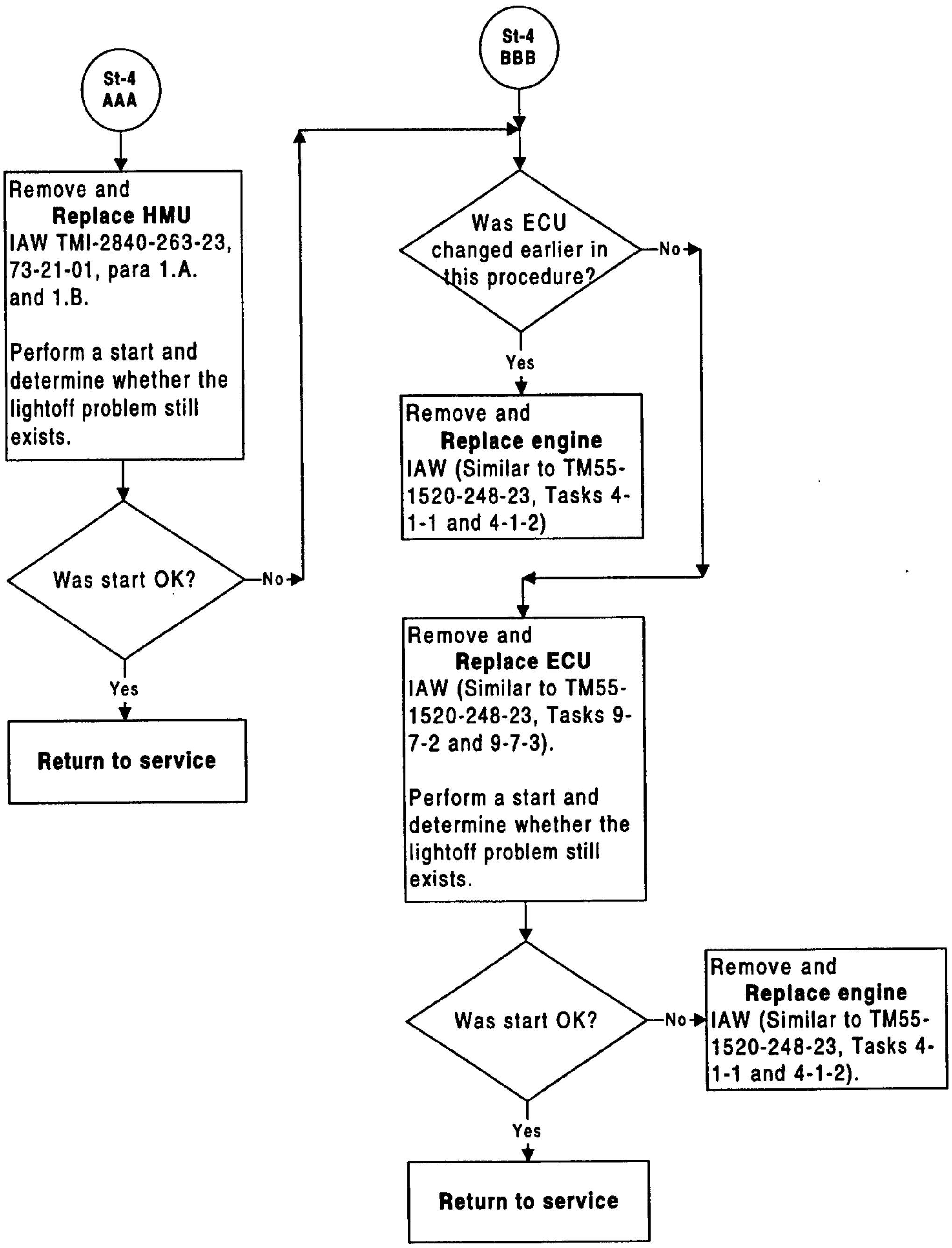
St-4. Rich/Delayed Light-off



St-4. Rich/Delayed Light-off



St-4. Rich/Delayed Light-off



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St-5 Motors To Required Speed But Does Not Light Off

During the normal start sequence, fuel flow is automatically initiated at 12% Ng (10% Ng at engine inlet temperatures below 20°F [-6°C]). Failure to light off at (or above) these speeds may be caused by the following:

- ECU fault
- HMU fault
- Fuel supply blocked or restricted, or no boost
- Throttle linkage misrigged
- Faulty ignition exciter, lead, or spark igniter
- Fuel nozzle spray pattern non-uniform
- Fuel nozzle immersion depth improperly set
- Combustion system anomaly
- Water in fuel

If the engine motors to the required speed but fails to light off, proceed as follows:

Connect Maintenance Terminal and determine whether FADEC faults are indicated. If so, perform maintenance actions as required to clear. If the ECU and/or HMU were replaced as a result of clearing these faults, attempt a start and determine whether the lightoff problem still exists.

Were ECU or HMU replaced? — No → Determine by observation...; Yes ↓

Was subsequent start OK? — No → Determine by observation...; Yes → **Return to service**

Determine by observation whether a cloud of atomized fuel exits from the engine exhaust during start attempts and is accompanied by fuel wetting of the inner walls of the exhaust collector and exhaust duct.

Does fuel cloud exit from exhaust? — No → St-5 C (Pg 3); Yes ↓

Exciter sparking rate OK? — Yes → St-5 B (Pg 2); No → St-5 D (Pg 6)

St-5 AAAA →

Replace ignition exciter
Remove and install IAW TMI-2840-263-23, 74-10-01, para 1.A., 2. A. and 2. B.

Exciter sparking rate OK? — Yes → St-5 E (Pg 6); No ↓

Remove and test igniter lead, IAW TMI-2840-263-23, 74-10-01, para 1. A., 2. A. and 2.B.

Igniter lead OK? — Yes → Install igniter lead...; No ↓

Replace igniter lead

Install igniter lead IAW TMI-2840-263-23, 74-20-02, para 1.B.

Exciter sparking rate OK? — Yes → St-5 E (Pg 6); No → St-5 A (Pg 2)

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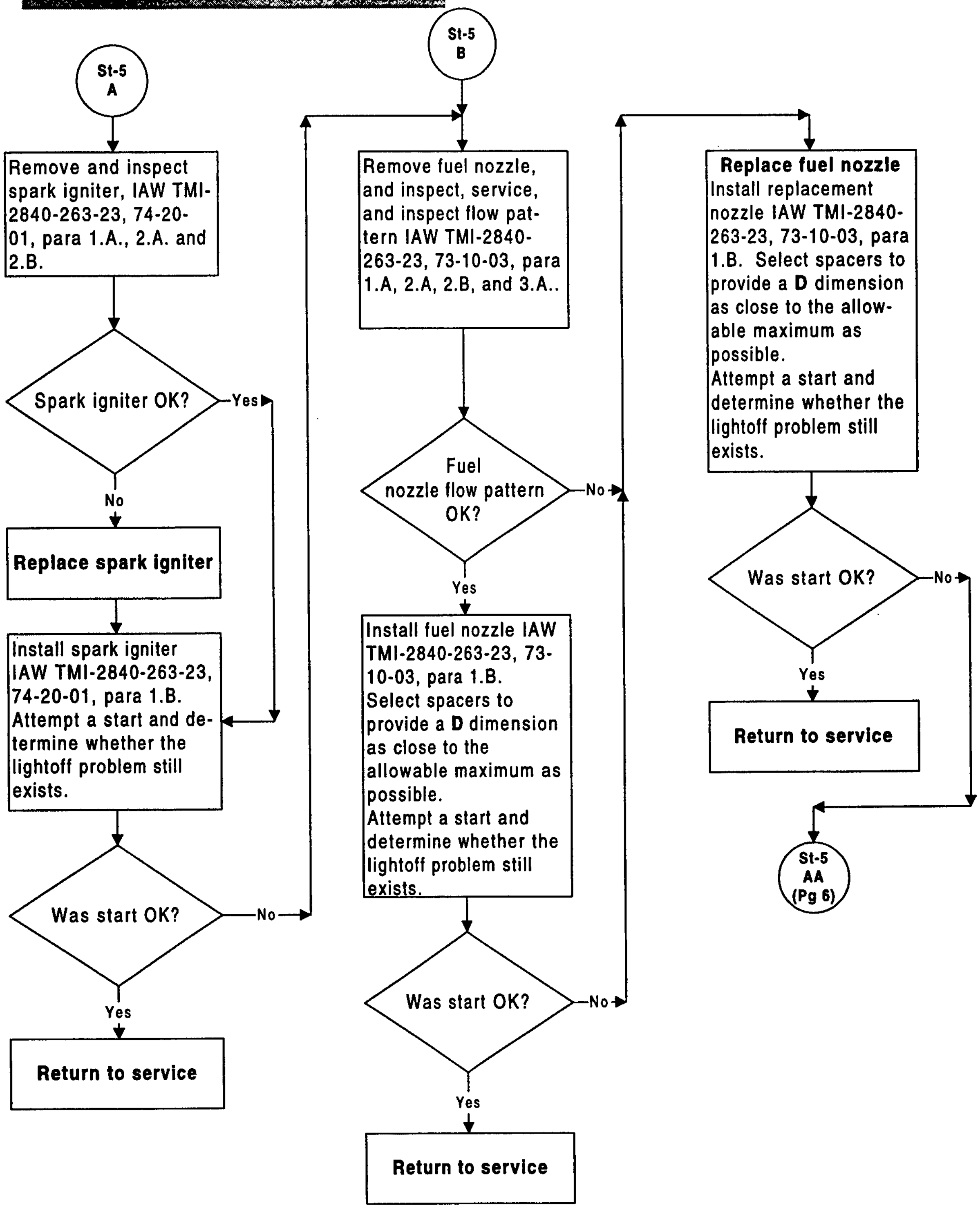
St-5 Motors To Required Speed But Does Not Light Off



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St-5 C

Inspect fuel control rigging IAW (Similar to TM55-2840-256-23, Task 7-2-1).

Rigging OK?

Yes

No

Rig throttle linkage IAW (Similar to TM55-1520-248-23, Task 4-6-1).
Attempt a start and determine whether the lightoff problem still exists.

Was start OK?

No

Yes

Return to service

- Verify adequate fuel supply to the engine by purging fuel system IAW (Similar to TM55-2840 -256-23, Task 7-1-1).
- During purging, observe for constant flow of fuel from end of fuel nozzle hose.

Constant flow of fuel from fuel nozzle hose?

No

Yes

Attempt a start and determine whether the lightoff problem still exists.

Was the start OK?

No

St-5 CCC (Pg 4)

Yes

Return to service

- Verify adequate supply of fuel in aircraft. Refuel as needed.
- Disconnect aircraft fuel supply hose at HMU fuel inlet port.
- Direct hose into a bucket or similar container.
- Be sure aircraft fuel shutoff valve fully open (lever fully forward).
- To prevent starter engagement, pull START circuit breaker on forward overhead console [TBD].
- Leave Fuel Boost switch OFF on forward overhead console.
- Engage fuel boost pump by turning on START switch on pilot's collective stick (if functioning, pump will be audible).
- Verify that fuel is flowing into bucket.
- Turn START switch OFF and verify fuel flow ceases.

Did boost pump provide flow of fuel?

No

St-5 AAA (Pg4)

Yes

St-5 BBB (Pg 5)

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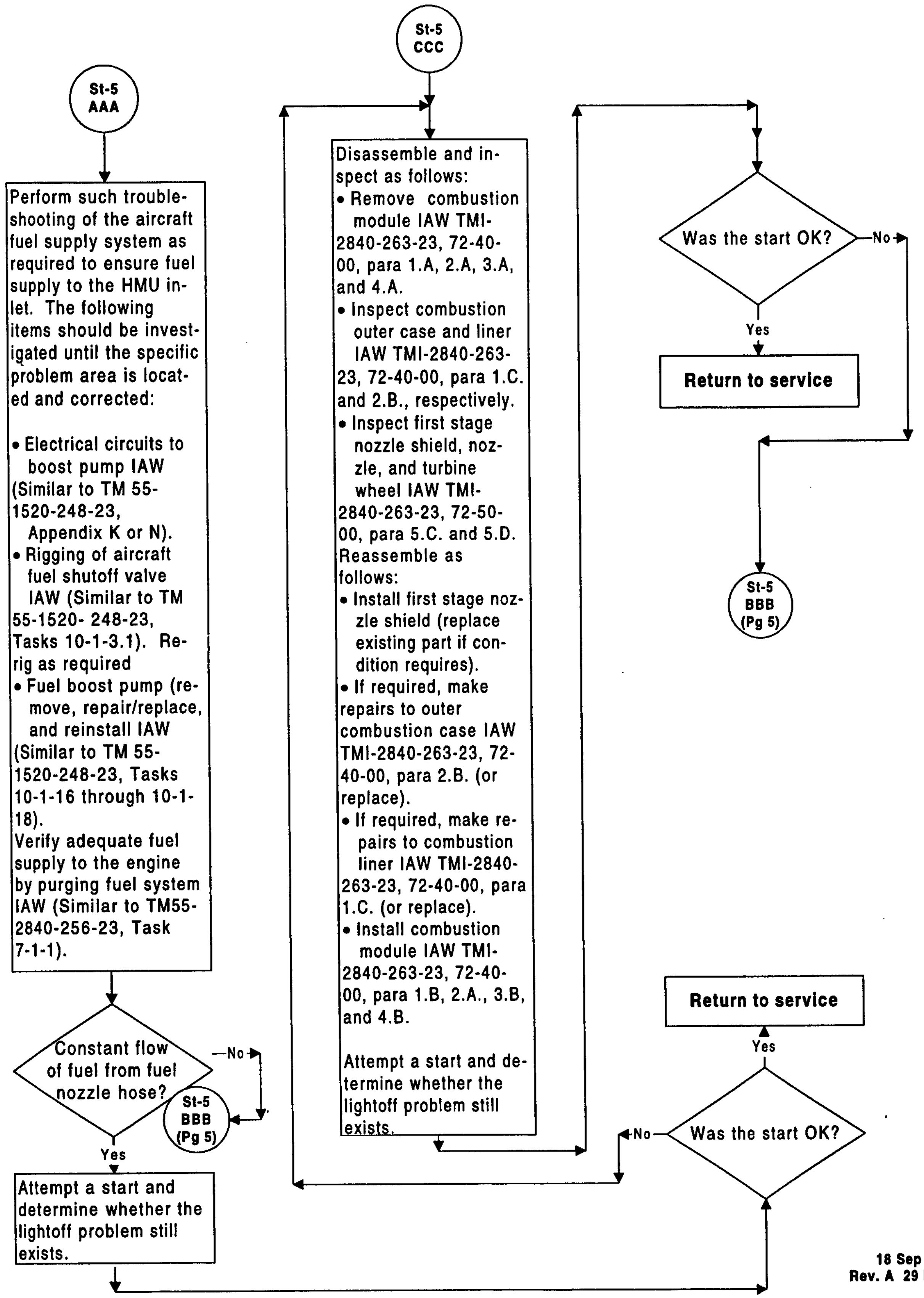
St-5 Motors To Required Speed But Does Not Light Off



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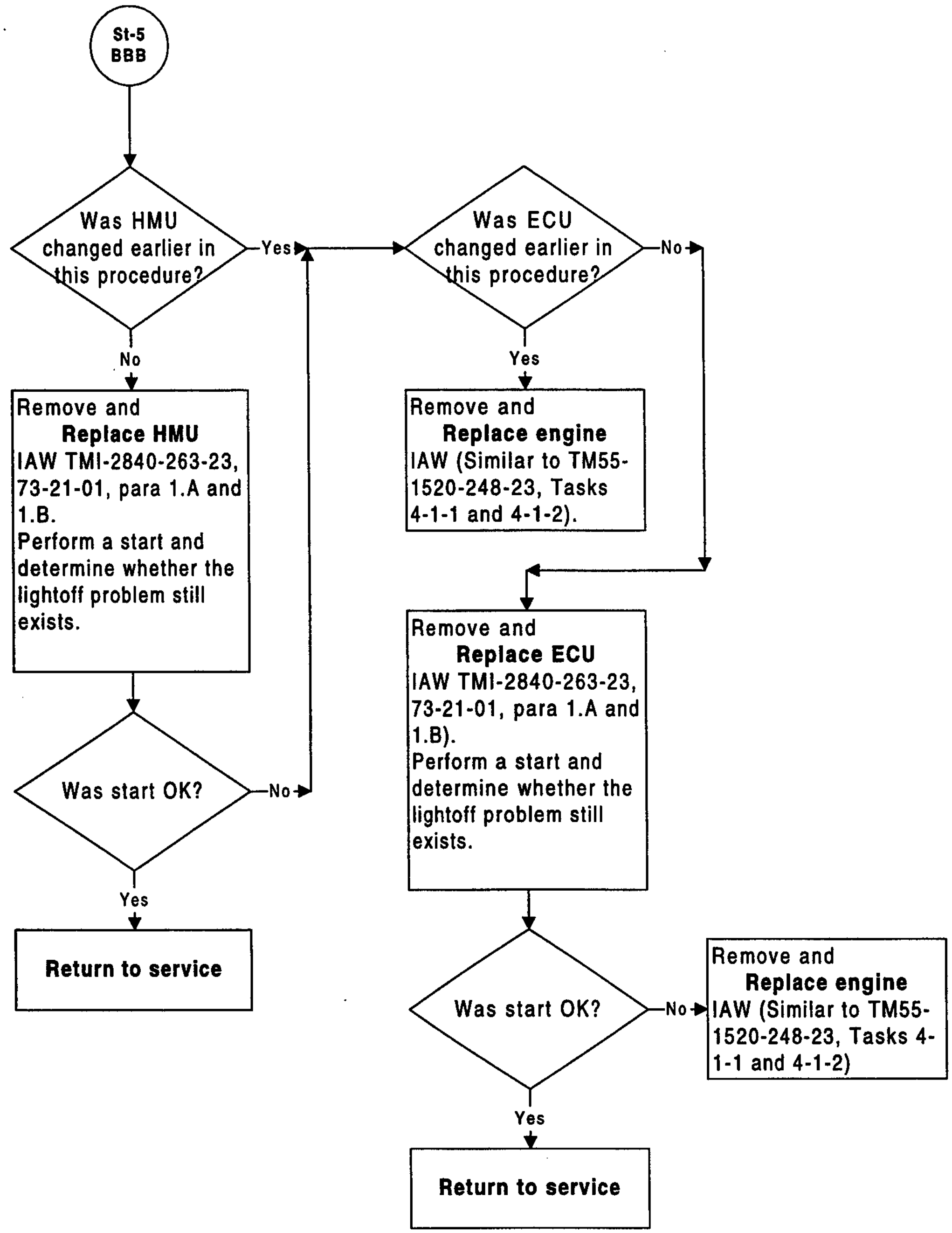
St-5 Motors To Required Speed But Does Not Light Off



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St-5 Motors To Required Speed But Does Not Light Off

St-5 D

Disconnect the engine accessory harness connector at the ignition exciter (Connector P12). Measure voltage between harness connector sockets 1 (hot) and 2 (ground), while motoring engine with starter (throttle in cutoff position), using multimeter. Voltage should be steady and between TBD and TBD VDC.

Measured voltage within limits? — Yes → St-5 AAAA (Pg 1)

No ↓

Troubleshoot engine and/or aircraft electrical circuits associated with power to the exciter IAW (Similar toTM 55-2840-256-23, Task 8-1-1) and (Similar to TM 55-1520-248-23, Appendix K or N)
If required, remove and replace the engine accessory harness IAW TMI-2840-263-23, 73-21-00, para 3.A. and 3. B.

Exciter sparking rate OK? — No → St-5 AAAA (Pg 1)

Yes ↑

Attempt a start and determine whether the lightoff problem still exists. ← St-5 E (Pg 6)

Was the start OK? — No → St-5 B (Pg 2)

Yes ↑

Return to service

St-5 AA

Draw fuel sample from bottom of aircraft fuel tank (sump drain) and check for water.
If high water content is determined, defuel aircraft IAW (Similar to TM 55-1520-248-23, Task 1-4-3), and refuel per tasks 1-4-1 or 1-4-2.

Flush aircraft and engine fuel systems as follows:

- Disconnect aircraft fuel supply hose at HMU fuel inlet port.
- Direct hose into a bucket or similar container.
- Be sure aircraft fuel shutoff valve fully open (lever fully forward).
- Turn Fuel Boost switch on forward overhead console ON. This engages fuel boost pump.
- Verify that fuel is flowing into bucket.
- Flow at least 2 gallons of fuel and then turn Fuel Boost switch OFF and verify fuel flow ceases.
- Remove and replace fuel filter element IAW TMI-2840-263-23, 73-21-00, para 3.A and 3.B.
- Flush fuel system IAW (Similar to TM 55- 2840-256-23, Task 7-1-4).

Attempt a start to determine whether the lightoff problem still exists.

Was the start OK? — No → St-5 CCC (Pg 4)

Yes ↓

Return to service

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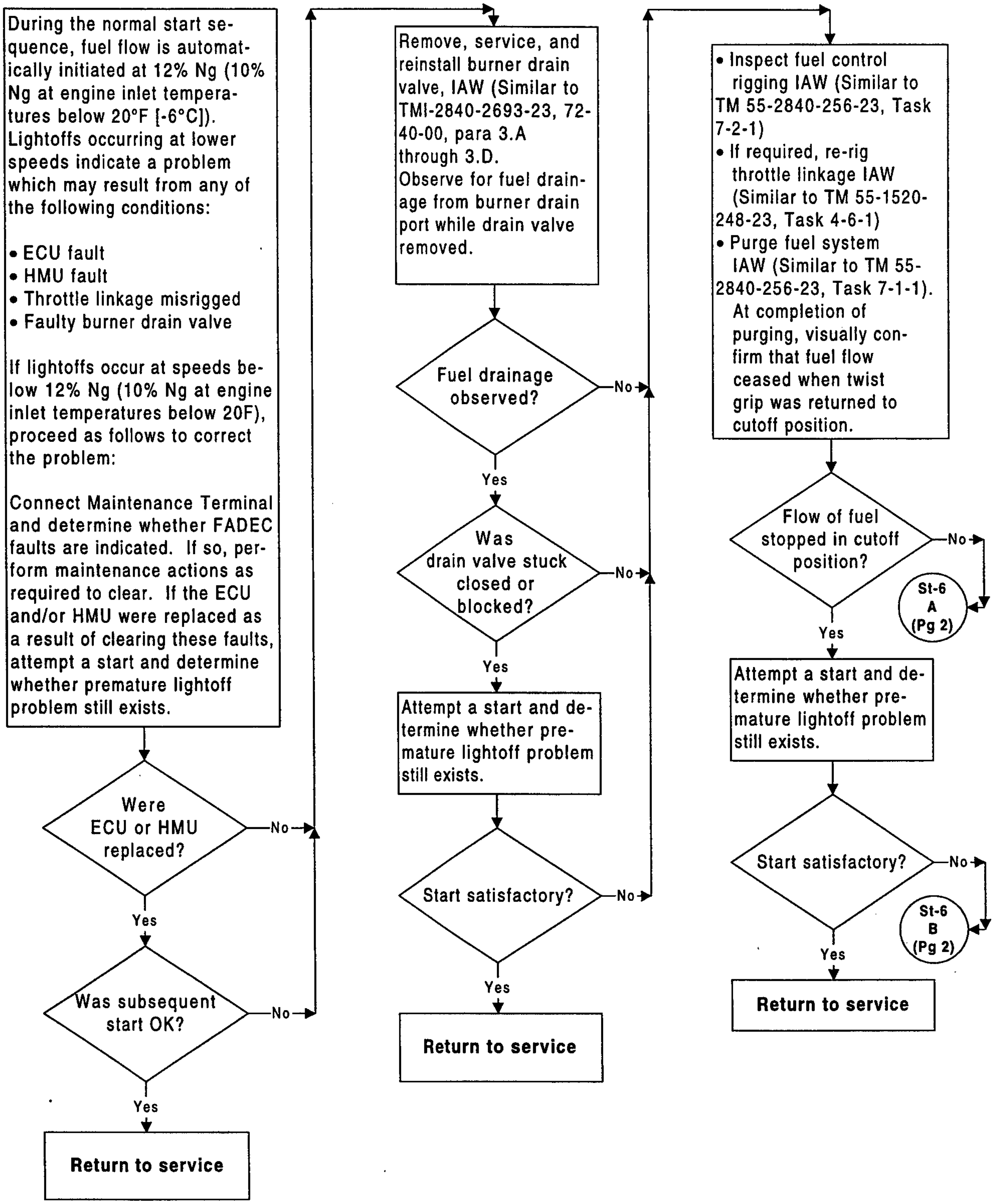
St-6 Lights Off Prior To Scheduled Fuel Introduction Speed



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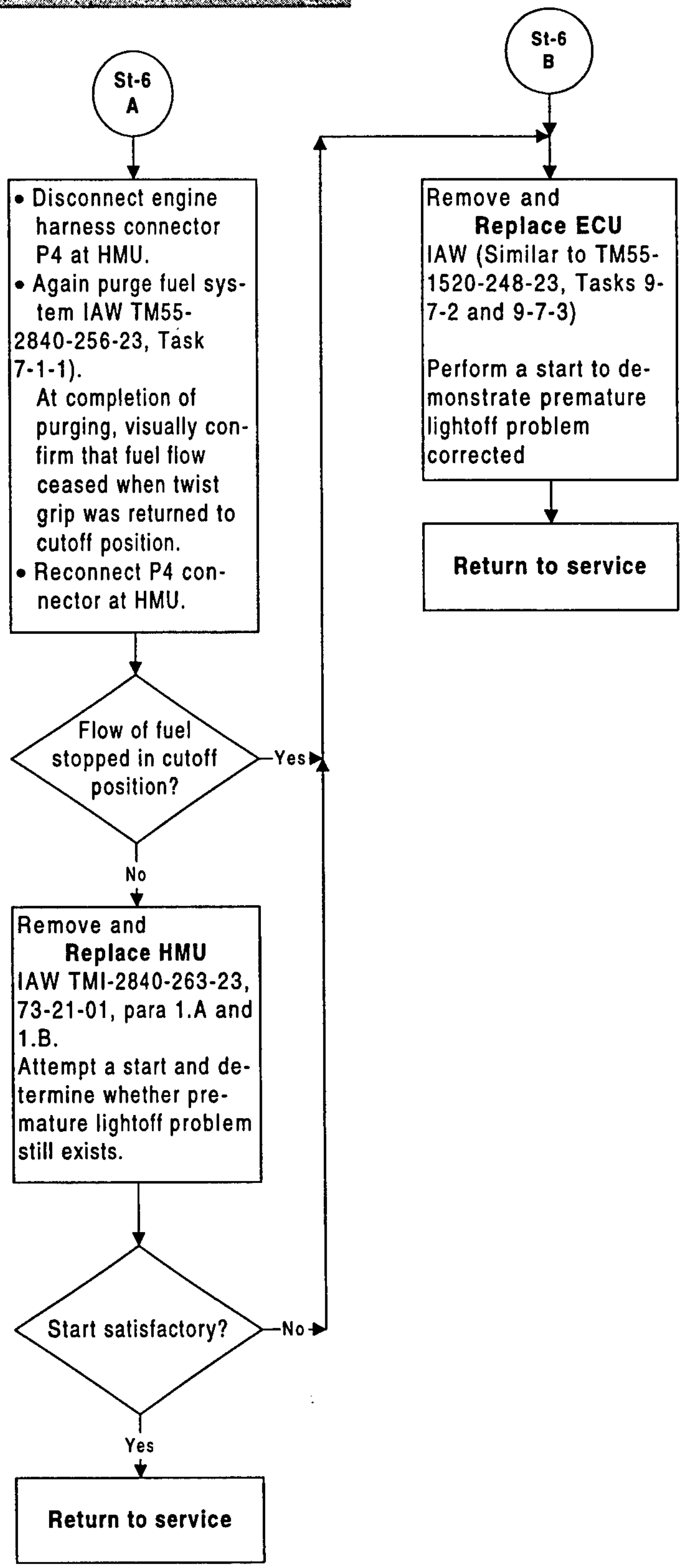
St-6 Lights Off Prior To Scheduled Fuel Introduction Speed



22 Sep 1997
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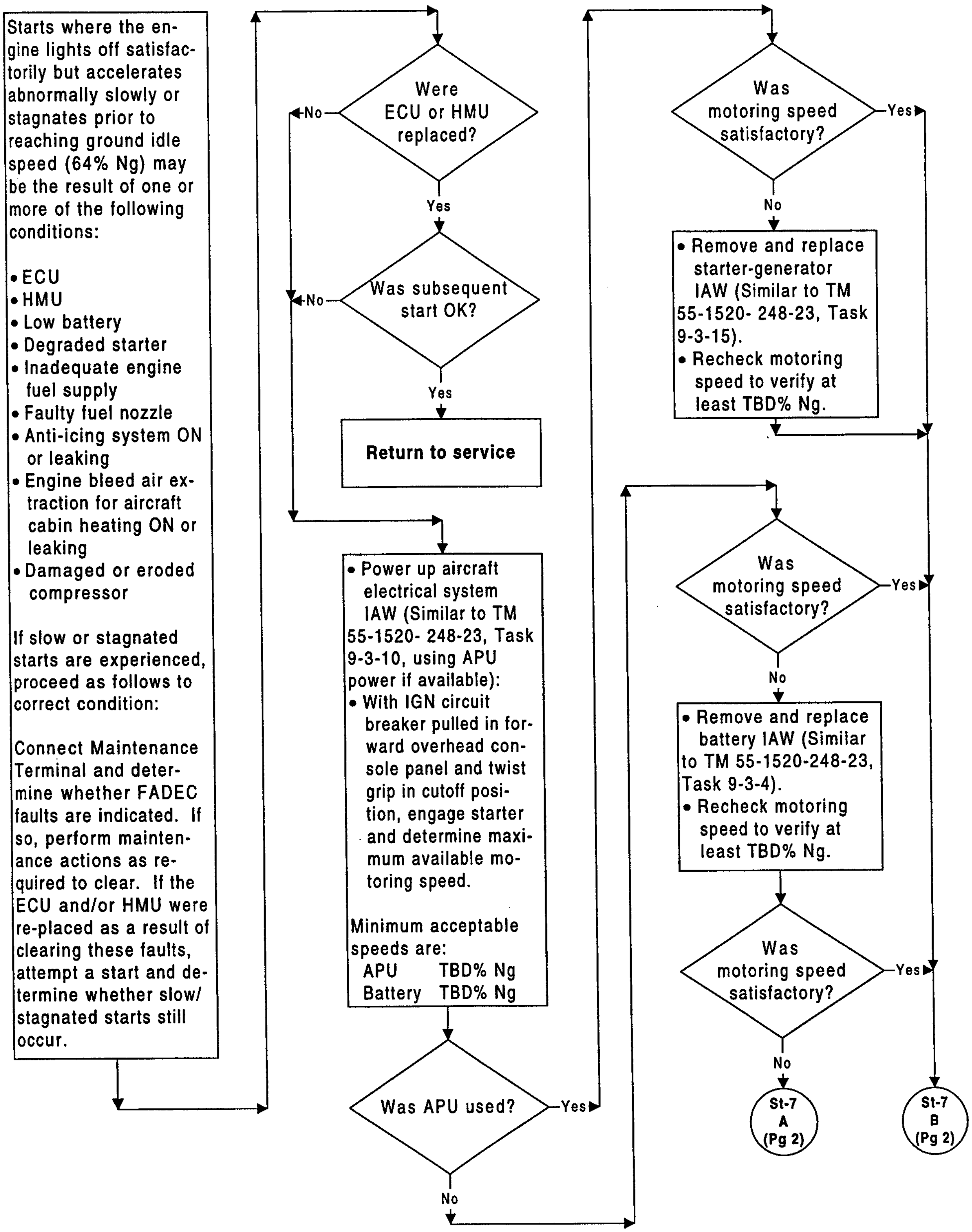
St-7. Lights Off But Does Not Accelerate To Idle At Normal Rate



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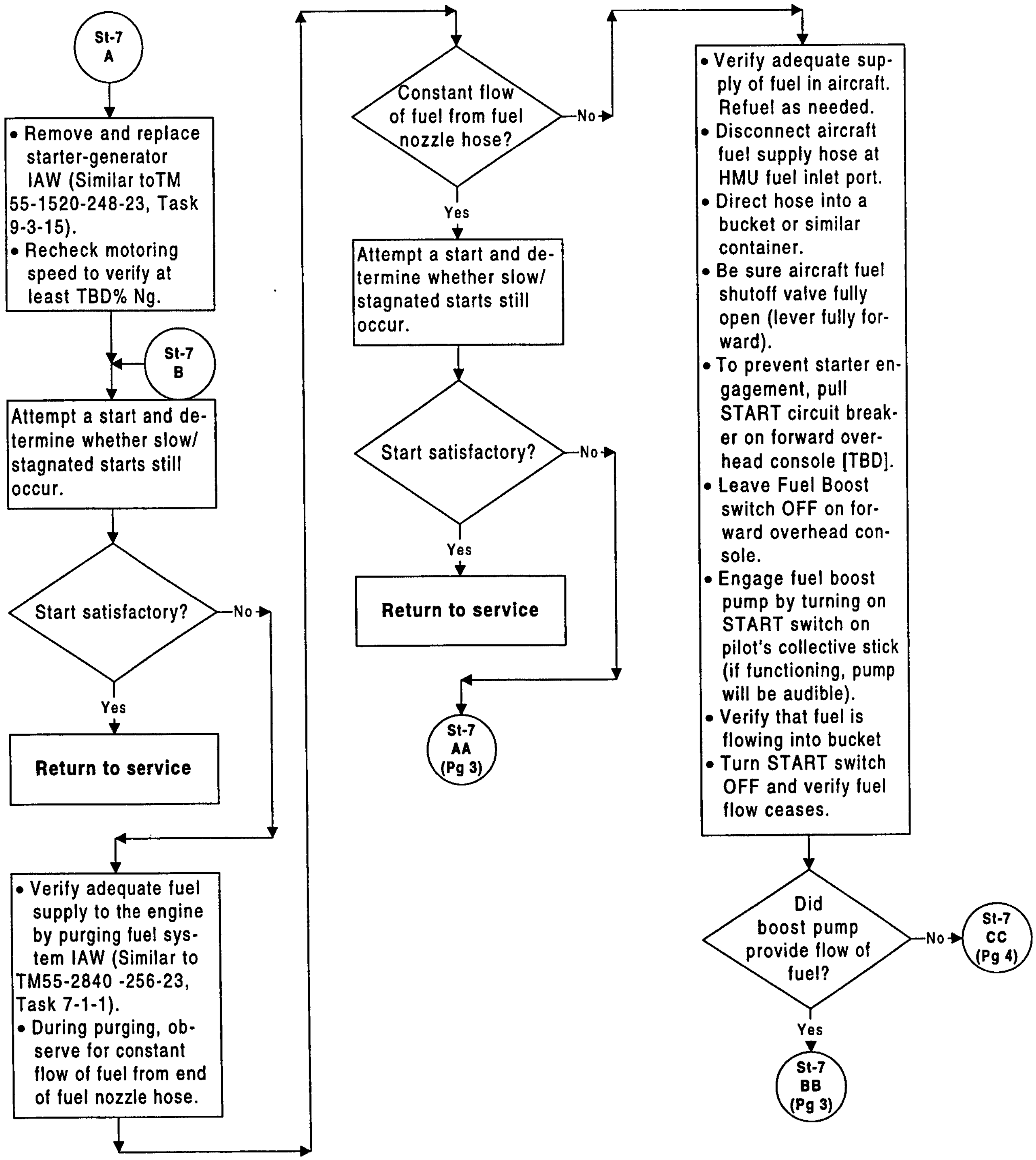
St-7. Lights Off But Does Not Accelerate To Idle At Normal Rate



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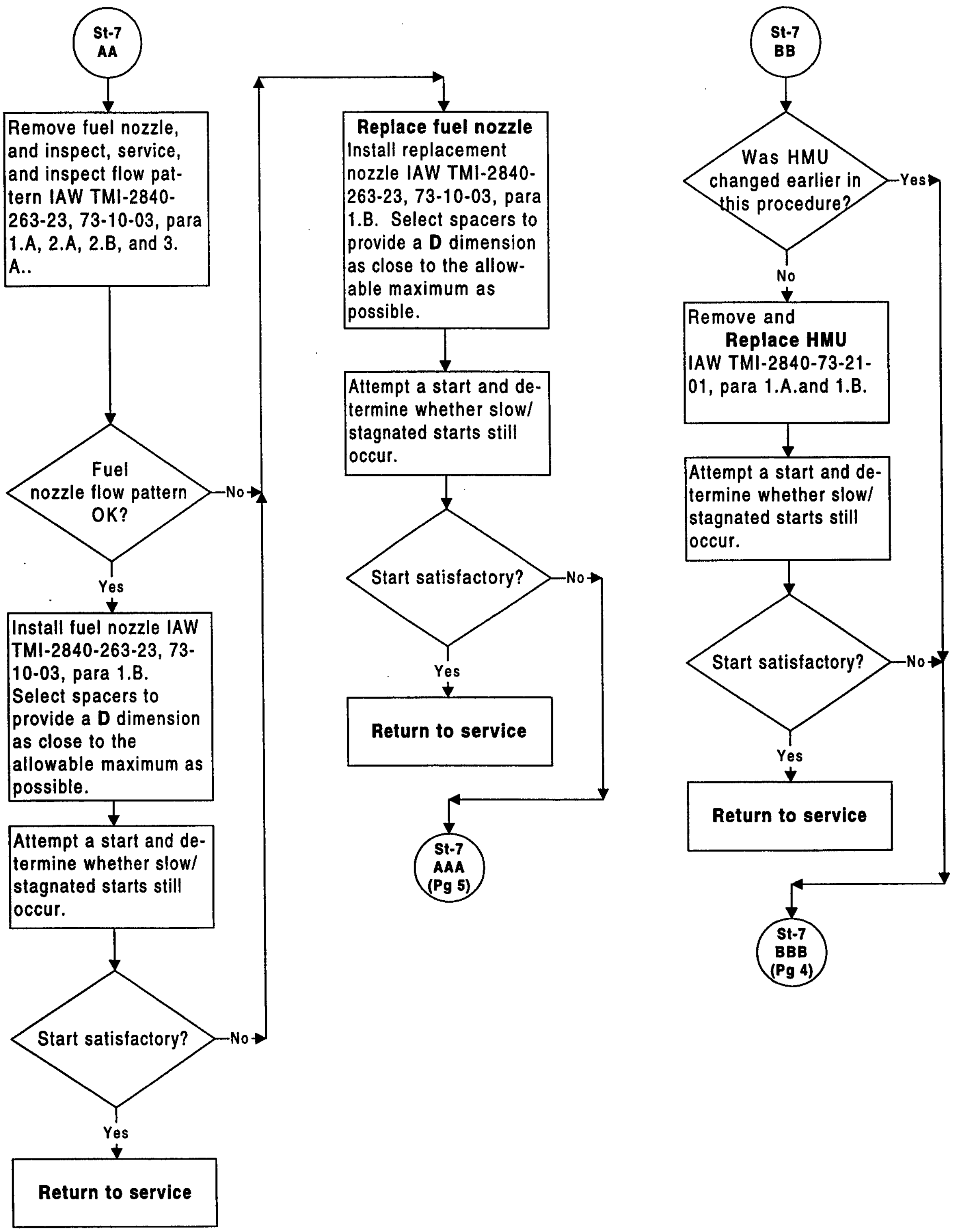
St-7. Lights Off But Does Not Accelerate To Idle At Normal Rate



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St-7. Lights Off But Does Not Accelerate To Idle At Normal Rate

St-7 CC

Perform such troubleshooting of the aircraft fuel supply system as required to ensure fuel supply to the HMU inlet. The following items should be investigated until the specific problem area is located and corrected:

- Electrical circuits to boost pump IAW (Similar to TM 55-1520-248-23, Appendix. K or N).
- Rigging of aircraft fuel shutoff valve IAW (Similar to TM 55-1520-248-23, Tasks 10-1-3.1. Rerig as required).
- Fuel boost pump (remove, repair/replace, and reinstall IAW (Similar to TM 55-1520-248-23, Tasks 10-1-16 through 10-1-18).

Verify adequate fuel supply to the engine by purging fuel system IAW (Similar to TM55-2840-256-23, Task 7-1-1).

Constant flow of fuel from fuel nozzle hose?

No — St-7 BB (Pg 3)

Yes — Attempt a start and determine whether slow/stagnated starts still occur.

Start satisfactory?

No — St-7 AA (Pg 3)

Yes — **Return to service**

St-7 BBB (Pg 4)

Remove and **Replace ECU** IAW (Similar to TM55-1520-248-23, Tasks 9-7-2 and 9-7-3).

Attempt a start and determine whether slow/stagnated starts still occur.

Start satisfactory?

No — St-7 AA (Pg 3)

Yes — **Return to service**

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St-7
AAA

Excessive air bleed or air leakage from the compressor, or between the compressor and turbine, may be the cause of the problem. Different means will be used to search for the leakage, depending on whether the engine can reach ground idle conditions without exceeding limits.

Can engine reach idle without exceeding limits?

Yes → Start engine and stabilize at ground idle.

Inspect for air leakage in the following areas and, if located, make repairs IAW the referenced tasks in TMI-2840-263-23, 72-30-00:

- COMPRESSOR SCROLL -- include flanges for aircraft bleed air off-take and unused bleed air off-take. Leakage from cracks in scroll, or from scroll-to-shroud or scroll-to-rear diffuser flanges are cause for compressor module replacement, which requires engine removal and reinstallation. Inspect - Para 3.D./ Repair allowable leaks - and (Similar to *TM 55-1520-248-23, Task 4-1-5.*) Remove engine/replace compressor module/ reinstall engine - Para 1.A and 1. B. *(Similar toTM 55-1520-248-23, Tasks 4-1-1 & 4-1-2)*

- COMBUSTION MODULE -- Inspect - Task 4-1-1. Remove/repair/reinstall - Tasks 4-1-2, 4-1-3, 4-2-1, 4-2-2, 4-4-1, 4-4-2, 4-4-3, 4-4-5, & 4-4-6.

- ANTI-ICING SYSTEM -- Inspect - IAW TMI-2840-263-23, 72-40-00, para 1.C. and 2.C. Remove/repair/reinstall - Para1, Am 1.B., 2.A., and 2.B.

- AIRCRAFT BLEED AIR TUBE, from compressor scroll to heater mixing valve -- Inspect - use leak detection procedures of IAW TMI-2840-263-23, 75-10-01, para 3.A and 3.B. Remove/repair/reinstall IAW *(Similar to TM 55-1520-248-23, Tasks 4-1-5, 13-1-13, & 13-1-14)*

No → Visually inspect the following areas for evidence of air leakage, cracks, or looseness, and, if observed, make repairs IAW the referenced tasks in TMI-2840-263-23, 72-30-00:

- COMPRESSOR SCROLL -- include flanges for aircraft bleed air off-take and unused bleed air off-take. Leakage from cracks in scroll, or from scroll-to-shroud or scroll-to-rear diffuser flanges are cause for compressor module replacement, which requires engine removal and reinstallation. Repair allowable leaks - Para 3.D., and *(Similar to TM 55-1520-248-23, Task 4-1-5).* Remove engine/replace compressor module/reinstall engine - Tasks 3-1-1, 3-2-2, 5-1-2, & 5-1-3, and *Para 1.A. and 1.B. and (Similar) to TM 55-1520-248-23, Tasks 4-1-1 & 4-1-2.*
- COMBUSTION MODULE -- Remove/repair/reinstall - IAW TMI-2840-263-23, 75-40-00, para 1.A., 1.B, 1.C., 2.A. and 2.B.

- ANTI-ICING SYSTEM -- Visually inspect as well as check for looseness of valve and gasket, tube between valve and front support, and tube between valve and solenoid. Remove/repair/reinstall - IAW TMI-2840-263-23, 75-10-01,para 2.A., 2.B., 3.A. and B.

- AIRCRAFT BLEED AIR TUBE, from compressor scroll to heater mixing valve -- Visually inspect as well as check for looseness. Remove/repair/reinstall *IAW (Similar to TM 55-1520-248-23, Tasks 4-1-5, 13-1-13, & 13-1-14)*

St-7
AAAA
(Pg 6)

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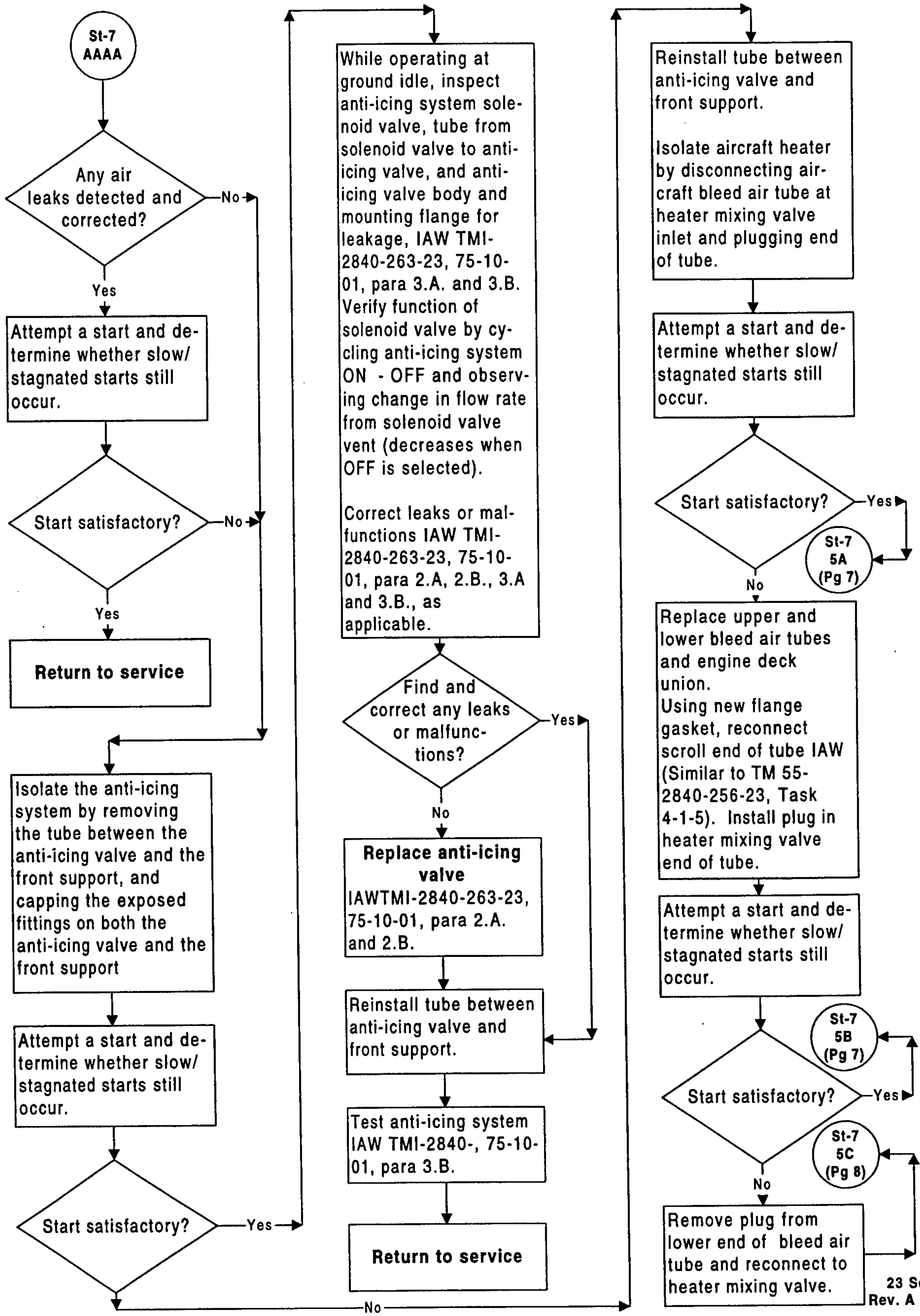
St-7. Lights Off But Does Not Accelerate To Idle At Normal Rate



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St-7. Lights Off But Does Not Accelerate To Idle At Normal Rate

St-7
5A

Repair or replace aircraft heater mixing valve IAW (Similar to TM 55-1520-248-23, Tasks 13-1-1, 13-1-2, 13-1-3, 13-1-4, & 13-1-5, as applicable). Remove plug and reconnect aircraft bleed air tube to mixing valve inlet.

Perform a start to verify satisfactory operation.

Return to service

St-7
5B

Remove plug and reconnect aircraft bleed air tube to mixing valve inlet.

Attempt a start and determine whether slow/stagnated starts still occur.

Start satisfactory?

Yes

Return to service

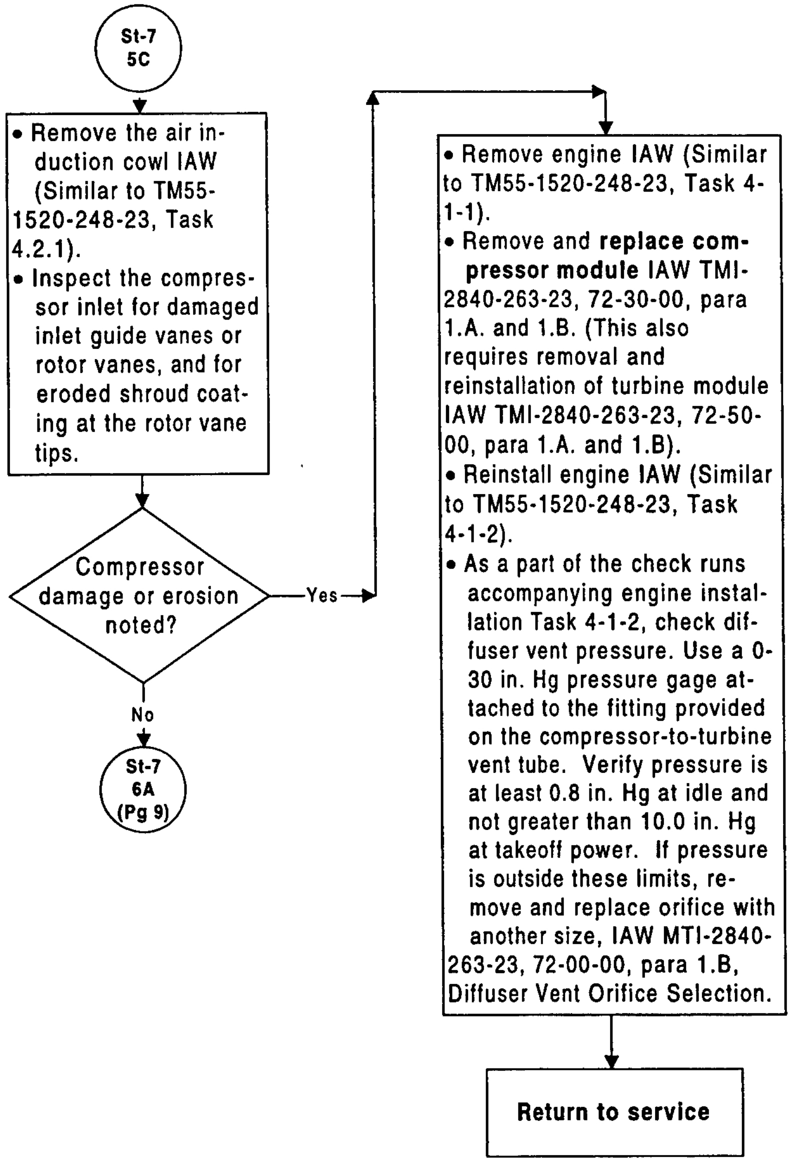
No

Repair or replace aircraft heater mixing valve IAW (Similar to TM 55-1520-248-23, Tasks 13-1-1, 13-1-2, 13-1-3, 13-1-4, & 13-1-5, as applicable).

Perform a start to verify satisfactory operation.

Return to service

St-7. Lights Off But Does Not Accelerate To Idle At Normal Rate



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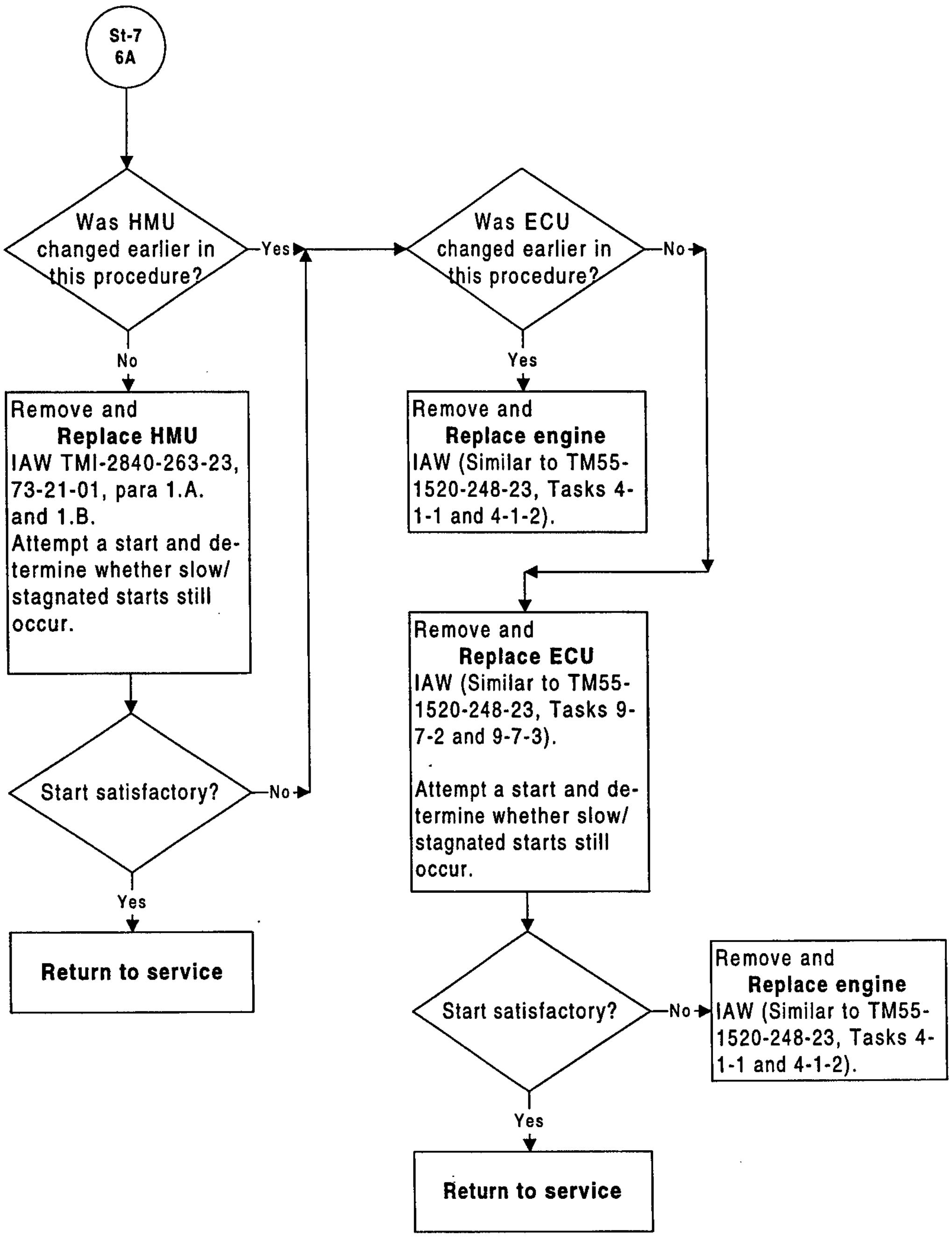

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St-8. MGT Too High During Start

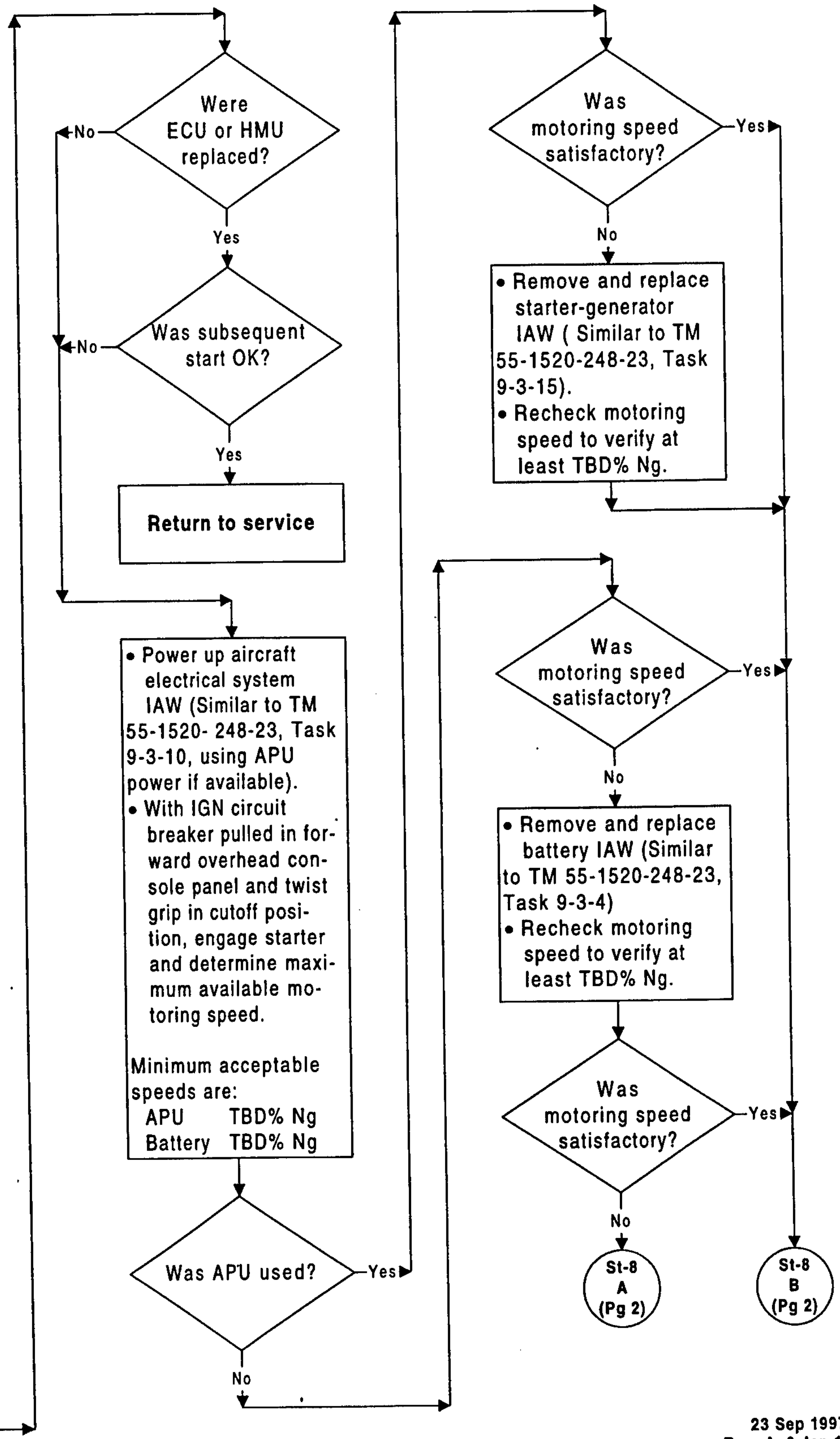
During starting, the FADEC controls Ng acceleration rate, from lightoff to ground idle. If MGT exceeds 1300°F (704°C), the acceleration rate is decreased. Starts are automatically aborted if MGT exceeds 1550°F (843°C), except at altitudes above 10,000 ft, or when MGT immediately before lightoff is above 180°F (82°C), in which cases the abort temperature is 1700°F (927°C).

Factors which could cause high starting MGT are:

- ECU
- HMU
- Insufficient fuel drainage time since last start
- High residual MGT at start initiation
- Low battery
- Degraded starter
- Faulty fuel nozzle
- Excessive compressor bleed or air leakage

If hot starts are experienced, proceed as follows to correct condition:

Connect Maintenance Terminal and determine whether FADEC faults are indicated. If so, perform maintenance actions as required to clear. If the ECU and/or HMU were replaced as a result of clearing these faults, attempt a start and de-termine whether hot starts still occur.



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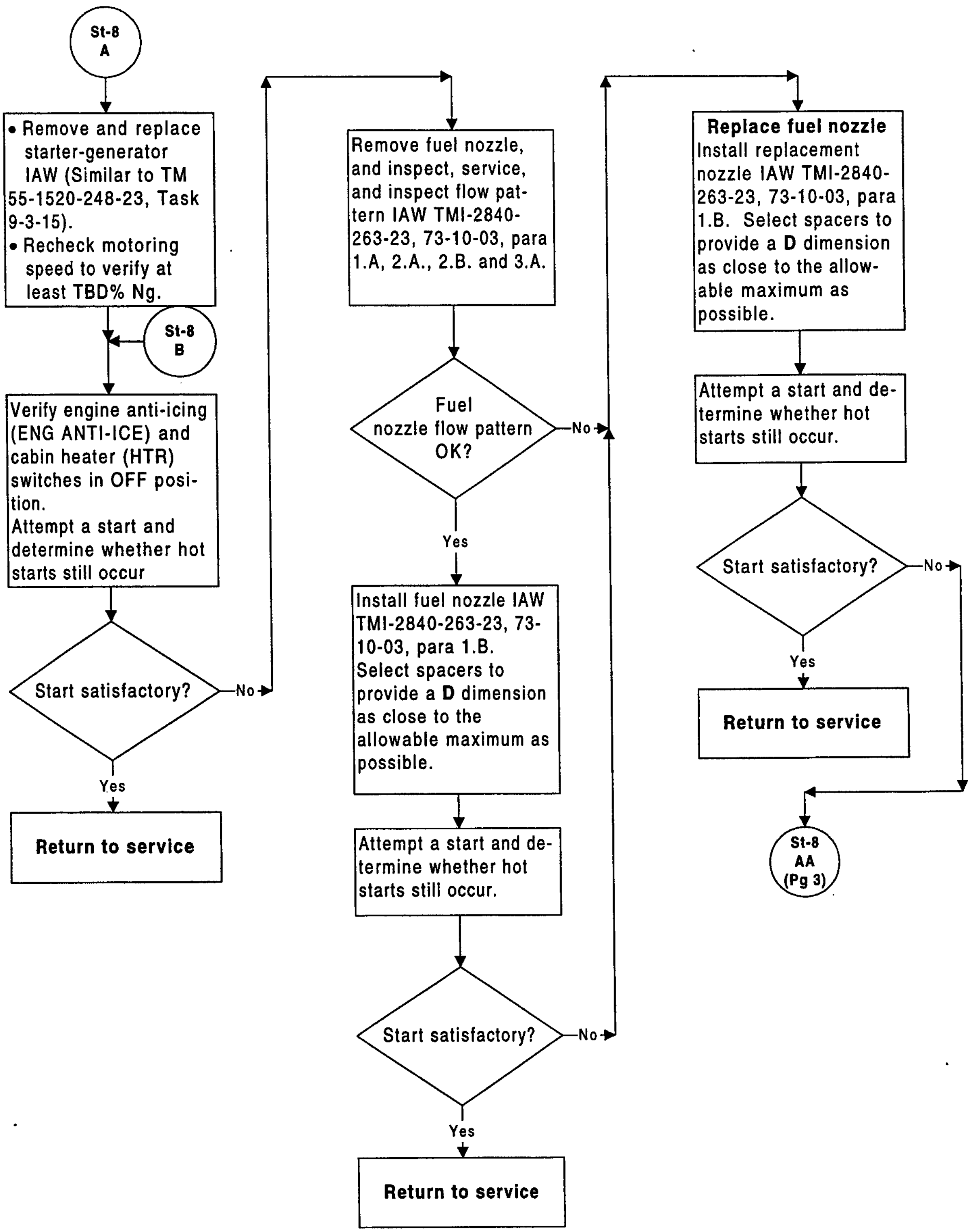

23 Sep 1997
Rev. A 9 Jan 1998

St-8. MGT Too High During Start

St-8
AA

Excessive air bleed or air leakage from the compressor, or between the compressor and turbine, may be the cause of the problem. Different means will be used to search for the leakage, depending on whether the engine can reach ground idle conditions without exceeding limits.

Can engine reach idle without exceeding limits?

Yes → Start engine and stabilize at ground idle.

Inspect for air leakage in the following areas and, if located, make repairs IAW the referenced tasks in TMI-2840-263-23:

- COMPRESSOR SCROLL -- include flanges for aircraft bleed air off-take and unused bleed air off-take. Leakage from cracks in scroll, or from scroll-to-shroud or scroll-to-rear diffuser flanges are cause for compressor module replacement, which requires engine removal and reinstallation. Inspect - Para3.D. Repair allowable leaks - Para 3.D., and *(Similar to TM 55-1520-248-23, Task 4-1-5)*. Remove engine/replace compressor module/ reinstall engine - Para 1.Am 1.B.; and *(Similar to TM 55-1520-248-23, Tasks 4-1-1 & 4-1-2)*.
- COMBUSTION MODULE -- Inspect - IAW TMI-2840-263-23, 72-40-00, para 1.C. and 2.C. Remove/repair/reinstall - Para 1.A., 1.B., 2.A. and 2.B.
- ANTI-ICING SYSTEM -- Inspect /IAW TMI-2840-263-23, 75-10-01, para 2.A., 2.B., 3.A. and 3.B. Remove/repair/reinstall - Tasks 9-2-1, 9-2-2, 9-3-1, & 9-3-2.
- AIRCRAFT BLEED AIR TUBE, from compressor scroll to heater mixing valve -- Inspect - use leak detection procedures of IAW TMI-2840-263-23, 75-10-01, para 3.A. and 3.B. Remove/repair/reinstall IAW *(Similar to TM 55-1520-248-23, Tasks 4-1-5, 13-1-13, & 13-1-14)*.

No → Visually inspect the following areas for evidence of air leakage, cracks, or looseness, and, if observed, make repairs IAW the referenced tasks in MTI-2840-263-23:

- COMPRESSOR SCROLL -- include flanges for aircraft bleed air off-take and unused bleed air off-take. Leakage from cracks in scroll, or from scroll-to-shroud or scroll-to-rear diffuser flanges are cause for compressor module replacement, which requires engine removal and reinstallation. Repair allowable leaks - Para 3.D., and *(Similar to TM 55-1520-248-23, Task 4-1-5)*. Remove engine/replace compressor module/reinstall engine - Para 1.A., 1.B.; and *(Similar to TM 55-1520-248-23, Tasks 4-1-1 & 4-1-2)*.
- COMBUSTION MODULE -- Remove/repair/re-install - IAWTMI-2840-263-23, 72-40-00, para 1.A., 1.B., 1.C., 2.A., and 2.B.
- ANTI-ICING SYSTEM -- Visually inspect as well as check for looseness of valve and gasket, tube between valve and front support, and tube between valve and solenoid. Remove/repair/re-install - IAW TMI-2840-263-23, 75-10-01, para 2.A., 2.B., 3.A., and 3.B.
- AIRCRAFT BLEED AIR TUBE, from compressor scroll to heater mixing valve -- Visually inspect as well as check for looseness. Remove/repair/ reinstall *IAW (Similar to TM 55-1520-248-23, Tasks 4-1-5, 13-1-13, & 13-1-14)*.

St-8
AAA
(Pg 4)

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St-8. MGT Too High During Start

St-8 AAA

Any air leaks detected and corrected? — No →

Yes ↓

Attempt a start and determine whether hot starts still occur.

Start satisfactory? — No →

Yes ↓

Return to service

Isolate the anti-icing system by removing the tube between the anti-icing valve and the front support, and capping the exposed fittings on both the anti-icing valve and the front support.

Attempt a start and determine whether hot starts still occur.

Start satisfactory? — Yes →

No ↓

While operating at ground idle, inspect anti-icing system solenoid valve, tube from solenoid valve to anti-icing valve, and anti-icing valve body and mounting flange for leakage, IAW TMI-2840-263-23, 75-10-01, para 3.A. and 3.B. Verify function of solenoid valve by cycling anti-icing system ON - OFF and observing change in flow rate from solenoid valve vent (decreases when OFF is selected). Correct leaks or malfunctions IAW TMI-2840-263-23, 75-10-01, para 2.A., 2.B., 3.A. and 3.B., as applicable.

Find and correct any leaks or malfunctions? — Yes →

No ↓

Replace anti-icing valve
IAW TMI-2840-263-23, 75-10-01, para 2.A. and 2.B.

Reinstall tube between anti-icing valve and front support.

Test anti-icing system IAW TMI-2840-263-23, 75-10-01, para 3.B.

Return to service

Reinstall tube between anti-icing valve and front support.

Isolate aircraft heater by disconnecting aircraft bleed air tube at heater mixing valve inlet and plugging end of tube.

Attempt a start and determine whether hot starts still occur.

Start satisfactory? — Yes → St-8 AAAA (Pg 5)

No ↓

Replace upper and lower bleed air tubes and engine deck union.
Using new flange gasket, reconnect scroll end of tube IAW (Similar to TM 55-2840-256-23, Task 4-1-5). Install plug in heater mixing valve end of tube.

Attempt a start and determine whether hot starts still occur.

Start satisfactory? — Yes → St-8 BBBB (Pg 5)

No ↓

Remove plug from lower end of bleed air tube and reconnect to heater mixing valve. → St-8 CCCC (Pg 6)

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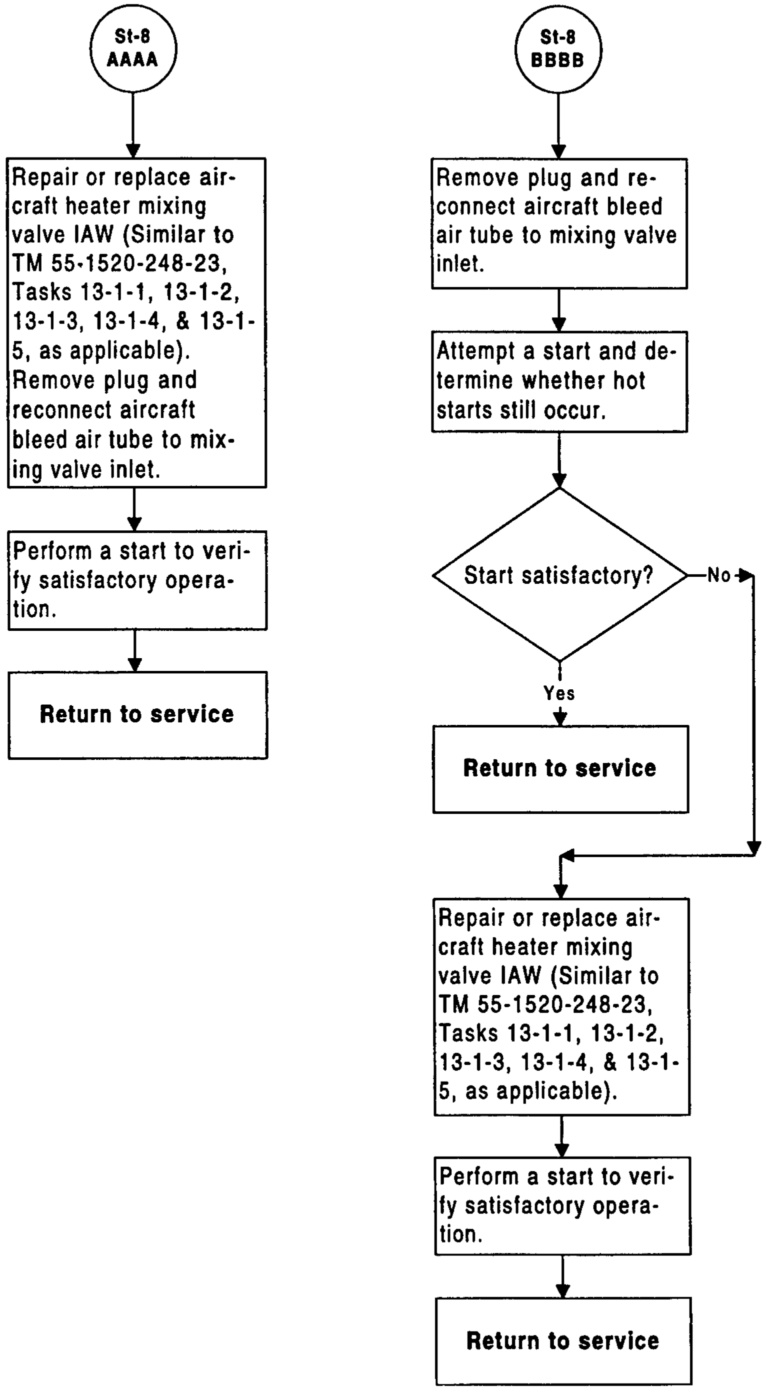
St-8. MGT Too High During Start



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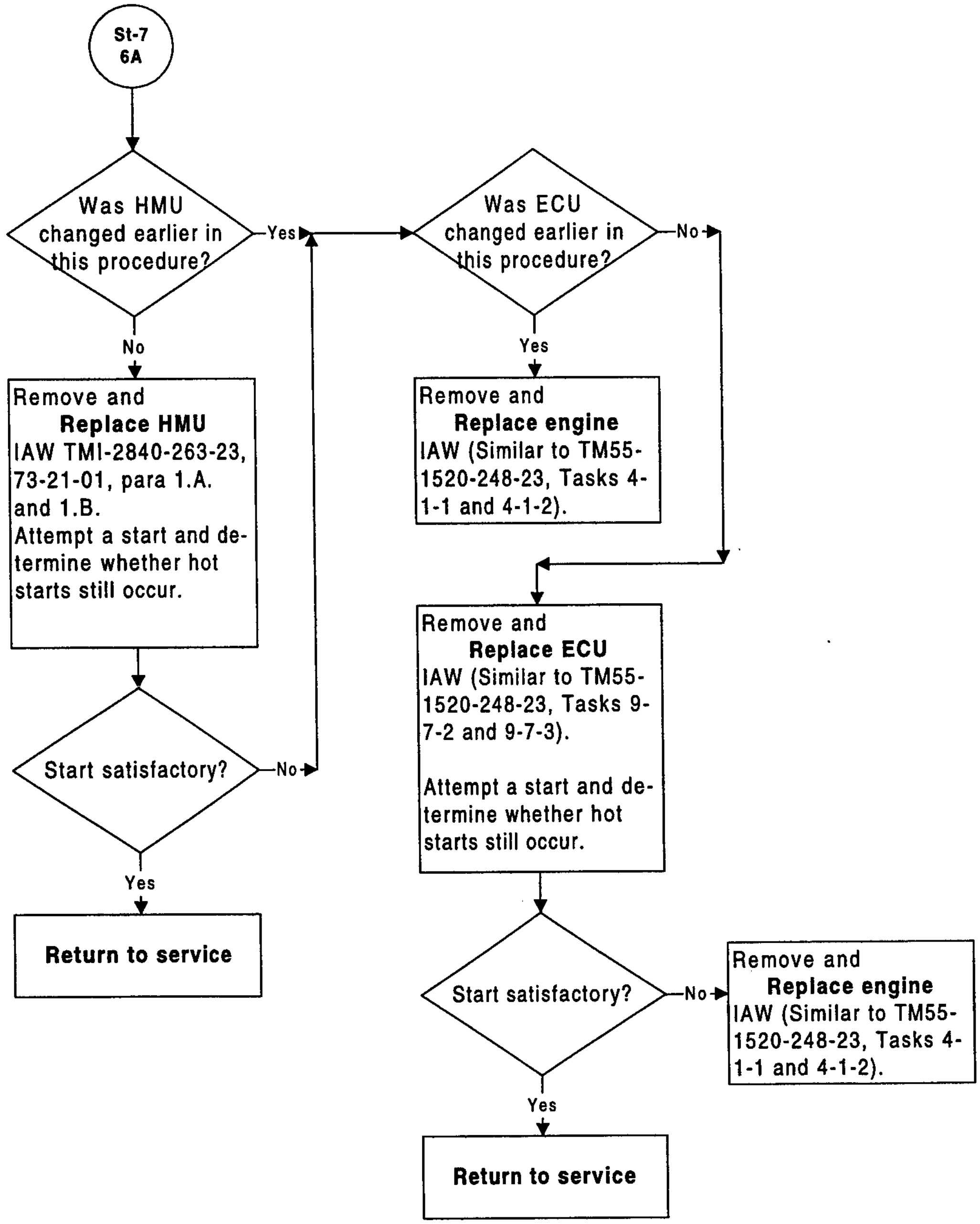
St-8. MGT Too High During Start



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St-9. MGT Too Low During Starts

During starting, the FADEC controls Ng acceleration rate, from lightoff to ground idle. If MGT exceeds 704°C (1300°F), the acceleration rate is decreased. If MGT is below 704°C, start times to ground idle should be on the order of 30 seconds [TBD]. If start times in that vicinity are accompanied by very low MGT values (538°C [1000°F] or less), there is probably an MGT measurement error.
If a slow start time accompanies the low MGT, other factors may be involved, and should be resolved IAW procedures delineated in troubleshooting sequence St-7 ***(Lights Off But Does Not Accelerate To Idle At Normal Rate)***.
One or more of the following items are probably responsible for the problem:
- ECU
- HMU
- Engine thermocouple harness
- Engine electrical harness
- Engine accessory harness
- Aircraft MGT indicator

If very cool starts are experienced, proceed as follows to correct condition:
Connect Maintenance Terminal and determine whether FADEC faults are indicated. If so, perform maintenance actions as required to clear. If the ECU and/or HMU were replaced as a result of clearing these faults, attempt a start and de-termine whether cool starts still occur.

Were ECU or HMU replaced?

No

Yes

Was subsequent start OK?

No

Yes

Return to service

Test the engine thermocouple assembly IAW MTI-2840-77-20-01, para 2.B. If harness is discrepant, remove, inspect, and reinstall or replace per 1.A., 1.B., and 2.A. respectively.

Did harness pass resistance test?

Yes

No

After replacement, attempt a start and determine whether cool starts still occur.

Start satisfactory?

No

Yes

Return to service

Field-check the calibration of the cockpit MGT indicator as follows:

- Remove the two nuts from the MGT harness terminal block studs and lift off MGT harness leads (but leave signal leads from engine electrical harness and engine accessory harness attached to the studs).
- Using Thermocouple Calibrator (OMEGA Model CL-300-1000C-K [TBD]or equivalent), attach the chromel lead of the calibrator to the chromel terminal stud and the alumel calibrator lead to the alumel terminal block stud.
- Reinstall the stud nuts, and torque to 18-24 in.-lb.
- Power up the aircraft with battery or APU.
- Connect Maintenance Terminal and set up to display real time analog parameters.
- Set thermocouple calibrator to 600°C (1112°F) and observe and record MGT value displayed on the cockpit MGT indicator and on the Maintenance Terminal MGT display.
- Repeat above steps at calibrator settings of 500°C (932°F) and 700°C (1292°F).
- MGT indications from cockpit digital MGT indicator and Maintenance Terminal should agree with the thermocouple calibrator within ± TBD °C (± TBD°F).

St-9 A (Pg 2)

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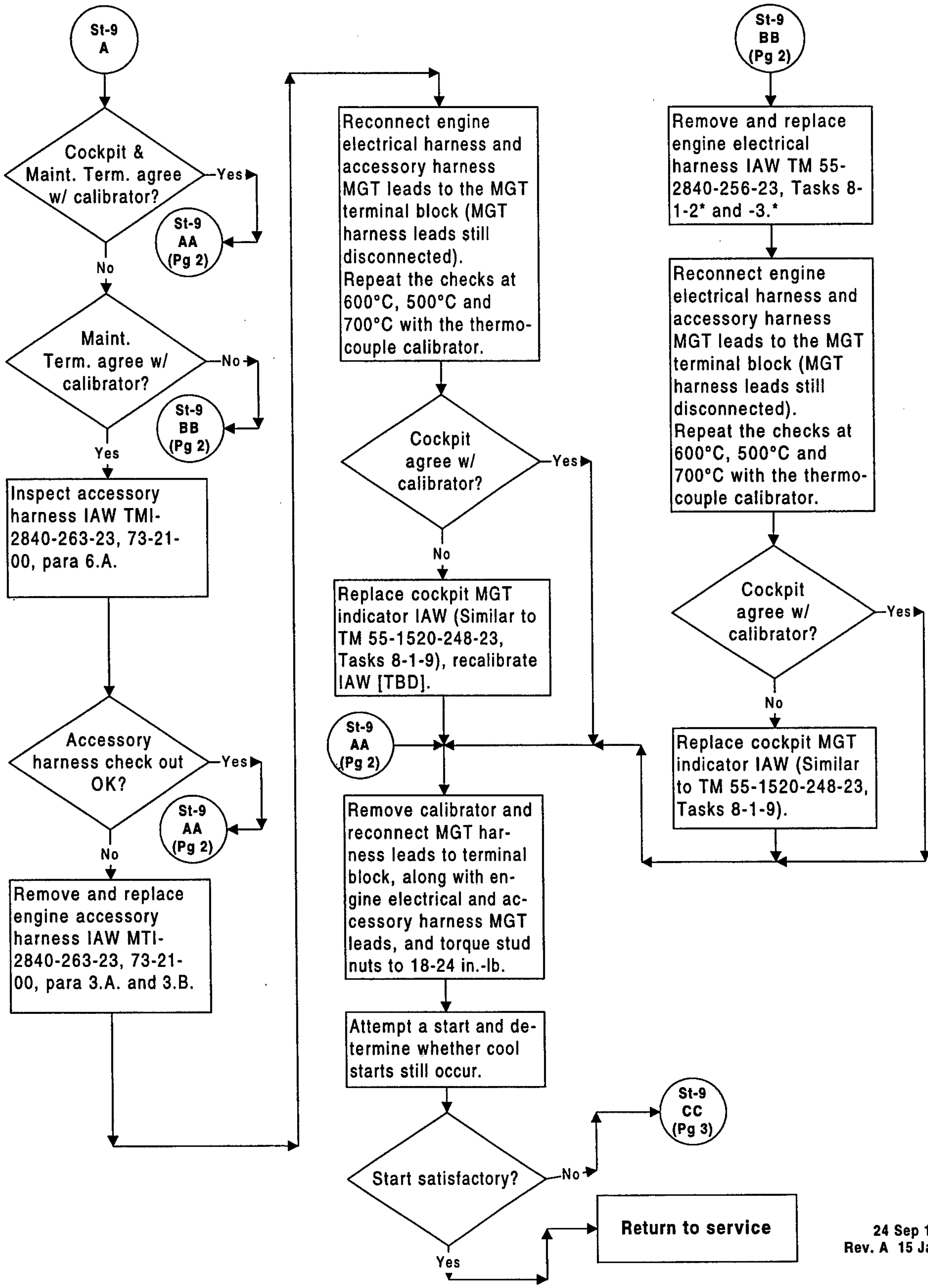

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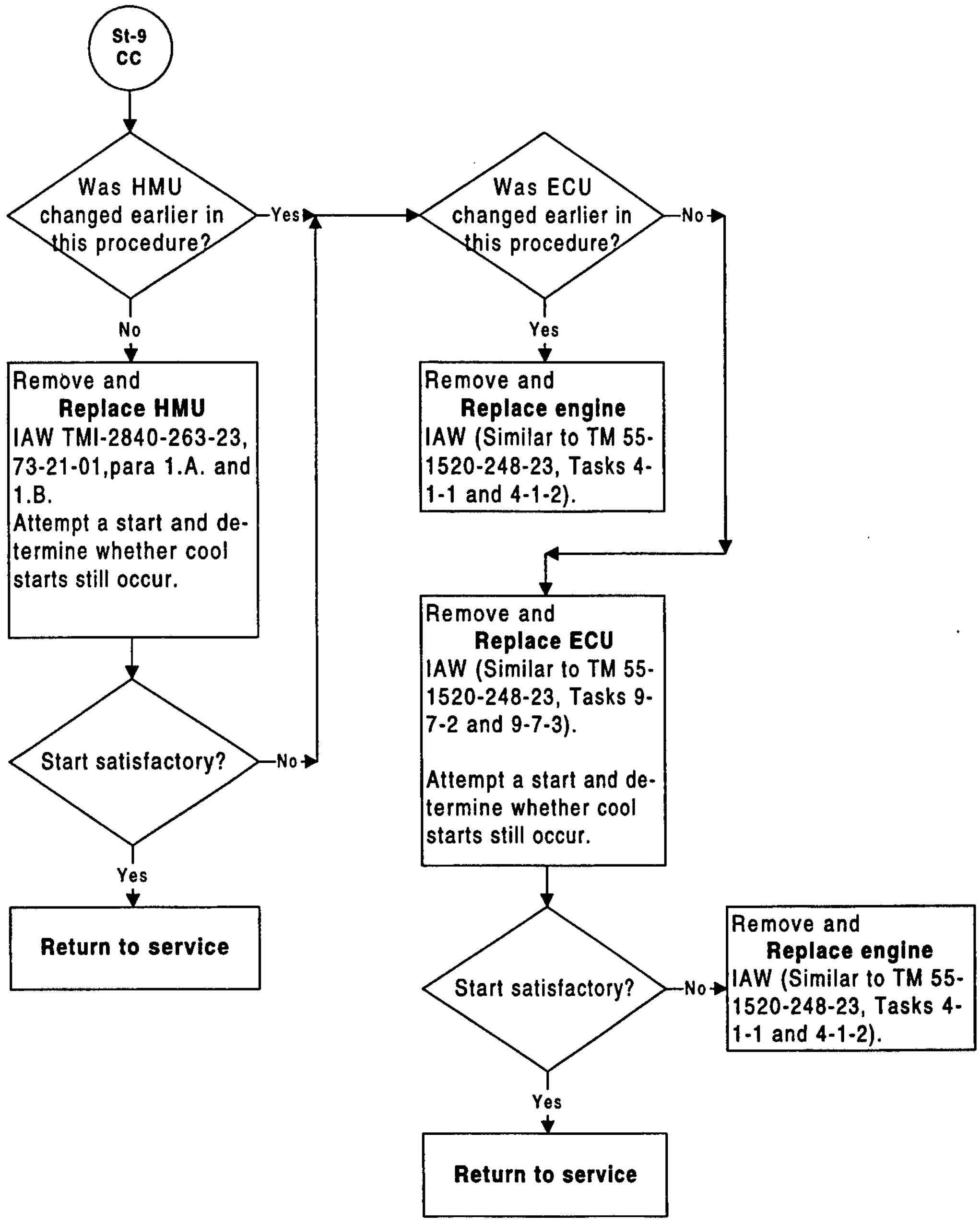
St-9. MGT Too Low During Starts



St-10. No Oil Pressure Indicated During Start

During starting, positive main oil pressure should be observed by the time Ng reaches Ground Idle speed (nominally 64%), and should stabilize at 50 to 130 psig at Ground Idle.
If no indication of main oil pressure occurs by the time Ground Idle is reached, the start must be aborted and the cause investigated and corrected.
Causes of the problem may be as follows:

- Failure of the oil pump to prime
- Restriction in oil pump supply line
- Insufficient amount of oil in oil tank
- Dirty main oil filter
- Faulty aircraft main oil pressure sensor or indicator
- Leaking O-ring on oil filter housing check valve or transfer tube
- Stuck oil pressure regulating valve
- Failed oil pump or oil pump drive
- Other accessory gearbox fault

If a main oil pressure indication is observed by the time Ground Idle is reached but it stabilizes at less than 50 psig, resolve IAW procedures delineated in troubleshooting sequence R-16 ***(Oil Pressure Too Low)***. If no main oil pressure is observed by the time Ground Idle is reached, proceed as follows to correct.

Service engine oil system (similar to TM 55-1520-248-23, Task 1-4-5.1, including steps 4 through 9 -- bleeding oil pump supply line).

Attempt engine start to verify proper main oil pressure.

Main oil pressure OK?

Yes

Return to service

No

Remove, inspect, service, reinstall main oil filter element IAW TM 1-2840-263-23, 72-60-00, para. 1.C.

Attempt engine start to verify proper main oil pressure.

Main oil pressure OK?

Yes

Return to service

No

Check engine oil pressure transducer (similar to TM 55-1520-248-23, Task 4-1-3).
Prior to step 4 (engine start and ground run), loosen tee fitting at oil pressure transducer inlet and motor engine to bleed pressure sense line.

Positive gage pressure indication by Ground Idle?

No

St-10 C (Pg 2)

Yes

Cockpit indicator & pressure gage agree?

Yes

St-10 B (Pg 2)

No

Replace main oil pressure transducer (similar to TM 55-1520-248-23, Task 4-1-4).
Repeat Task 4-1-3, preceded by loosening tee fitting at oil pressure transducer inlet and motoring engine to bleed pressure sense line.

Cockpit indicator & pressure gage agree?

Yes

St-10 B (Pg 2)

No

St-10 A (Pg 2)

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St-10. No Oil Pressure Indicated During Start

St-10 A

Troubleshoot cockpit oil pressure indicator and related aircraft wiring (similar to TM 55-1520-248-23, Appendix K, Section III).

St-10 B

Remove pressure gage and tee fitting from main oil pressure sense line. Loosen fitting at oil pressure transducer inlet and motor engine to bleed pressure sense line.

Perform engine start to verify proper main oil pressure.

Return to service

St-10 C

Remove pressure gage and tee fitting from main oil pressure sense line. Loosen fitting at oil pressure transducer inlet and motor engine to bleed pressure sense line.

Remove oil filter housing and check valve IAW TM 1-2840-263-23, 72-60-00, para 1.D. and 2.D.
Remove transfer tubes and inspect O-rings on both ends, as well as check valve O-rings.
Reinstall oil filter housing, transfer tubes, and check valve per para 2.F, using all new O-rings and gasket.

Perform engine start to verify proper main oil pressure

Main oil pressure OK?

Yes → **Return to service**

No →

Remove and inspect oil pressure regulator valve assembly (similar to TM 55-2840-256-23, Tasks 6-2-5 and 6-2-6).
Repair as needed and reinstall per Tasks 6-2-7 and -8.

Perform engine start to verify proper main oil pressure

Main oil pressure OK?

Yes → Adjust oil pressure regulating valve IAW TM 1-2840-263-23, 72-60-00, para 3.A.

Return to service

No → Remove and **Replace engine** (similar to TM 55-1520-248-23, Tasks 4-1-1 and 4-1-2).

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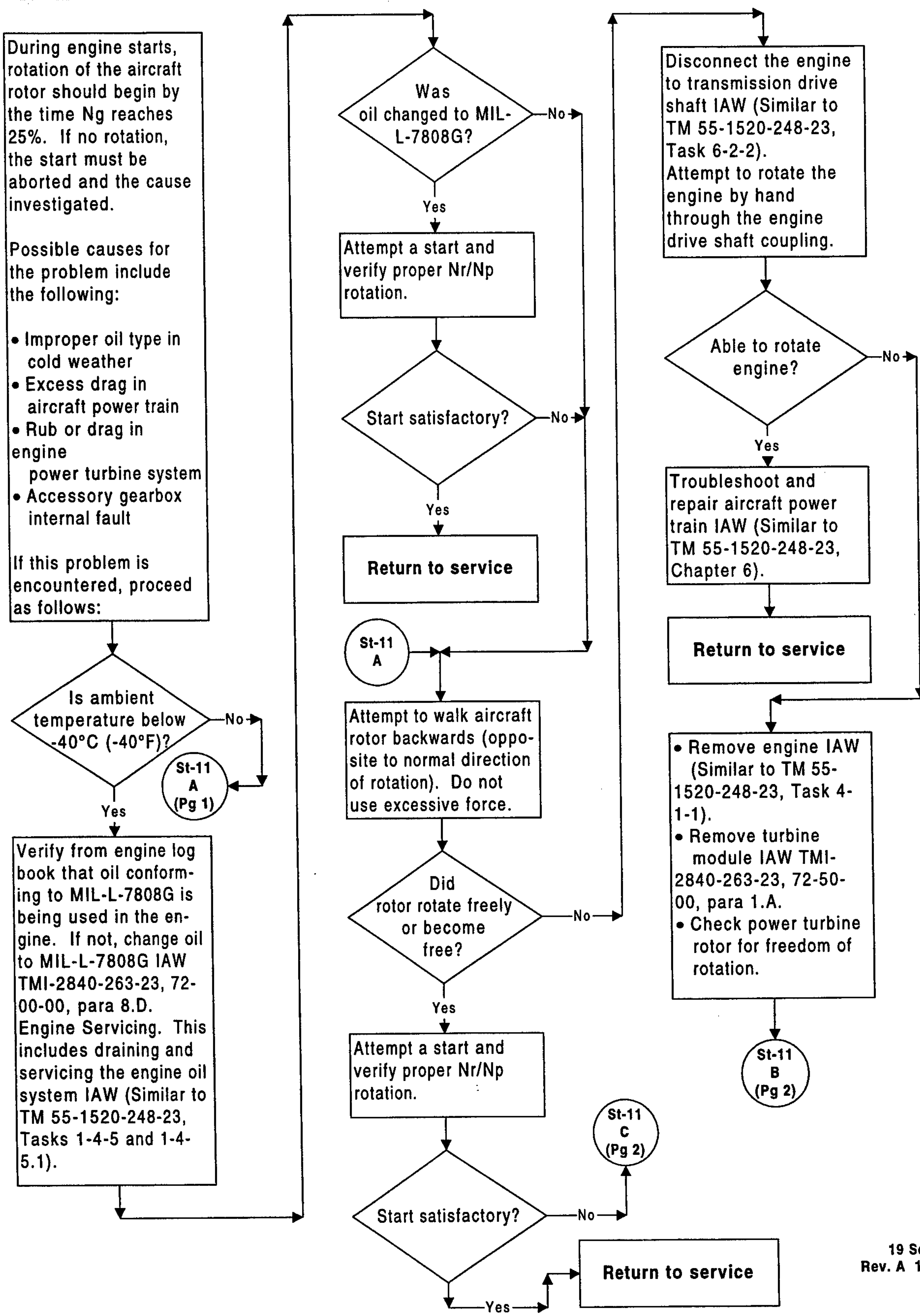
St-11. No Rotation Of Nr/Np By 25% Ng During Start



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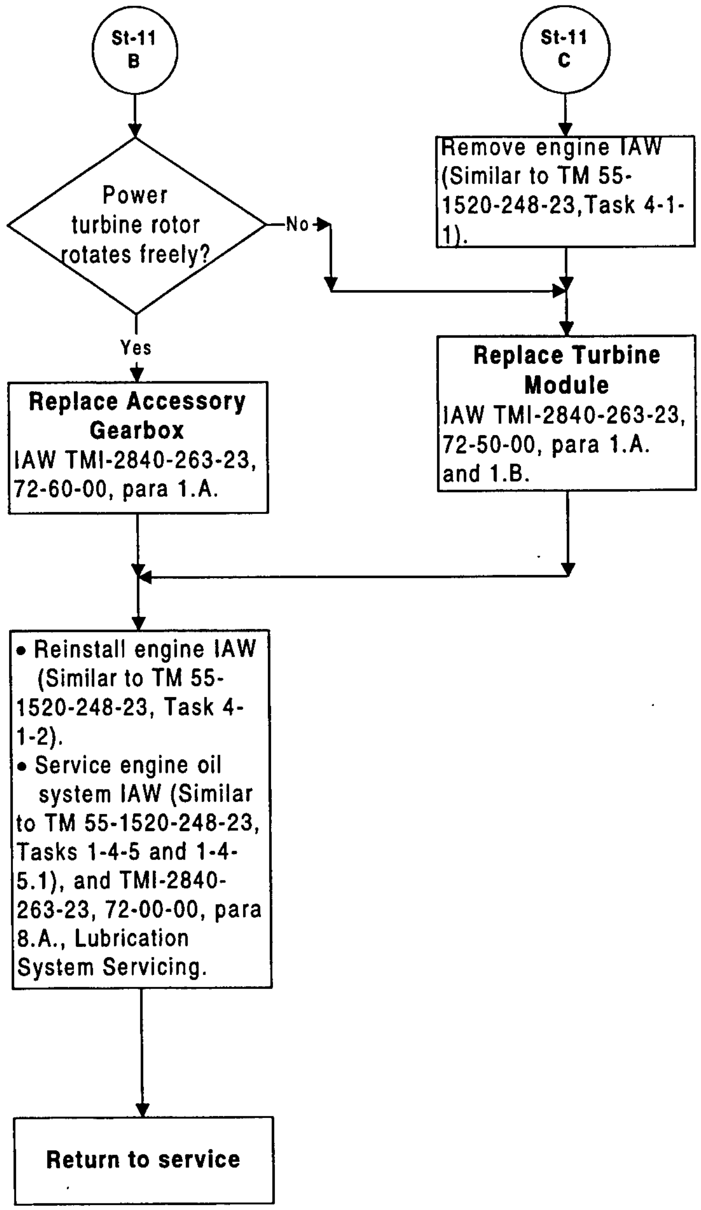
St-11. No Rotation Of Nr/Np By 25% Ng During Start



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St-12. Does Not Motor To Required Lightoff Speed

During starting, the FADEC introduces fuel at 12% Ng (10% Ng at ambient temperatures below 20°F [-6.7°C]). If the maximum available motoring speed is less than these speeds, there will be no fuel flow and thus the engine will not light off. The starter should be able to motor the engine to at least 15% Ng at 20°F and above, and to 12% Ng below 20°F.

Possible causes for low motoring speed are:

- Low battery
- Degraded starter
- Aircraft electrical system problems
- Mechanical drag or rub in gas generator rotor
- Excess oil in accessory gearbox creating drag on gears

If low motoring speed is encountered, proceed as follows:

- Power up aircraft electrical system IAW (Similar to TM 55-1520- 248-23, Task 9-3-10).
- On Multi-Parameter Display (MPD) unit, select **BATT V - START V**, to allow monitoring of battery and starter voltages.
- Pull IGN circuit breaker on forward overhead console panel and set twist grip to cutoff position.

- Engage starter and determine maximum available motoring speed.
- Note battery voltage prior to starter engagement and starter voltage at maximum cranking speed.
- Disengage starter and, during coastdown, listen for heavy rubbing noises from the engine and observe for an unusually rapid stop.

Heavy rub or rapid coastdown?

Yes → ST-12 A (Pg 2)

No ↓

Battery voltage before starter engagement should be at least **TBD** volts, and starter voltage at maximum cranking speed should be between **TBD** and **TBD** volts

Was battery voltage too low?

Yes ↓

Remove and replace battery IAW (Similar to TM 55-1520-248-23, Task 9-3-4).

Motor to verify at least minimum required Ng.

Return to service

No ↓

Was starter voltage too high?

Yes ↓

Remove and replace starter-generator IAW (Similar to TM 511520-248-23, Task 9-3-15).

Motor to verify at least minimum required Ng.

Return to service

No ↓

Starter voltage too low?

No → St-12 B (Pg 2)

Yes ↓

Troubleshoot and repair aircraft starter electrical system, IAW TM 55-1520-248-23, Appendix K, Section IV.

Motor to verify at least minimum required Ng.

Return to service

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St-12. Does Not Motor To Required Lightoff Speed

St-12 A

Remove starter-generator IAW (Similar to TM 55-1520-248-23, Task 9-3-15) Insert engine turning tool into starter drive pad and rotate gas generator gear train and rotor system by hand to confirm heavy rub condition.

Remove and **Replace engine** IAW (Similar to TM55-1520-248-23, Tasks 4-1-1 and 4-1-2).

St-12 B

Remove bottom magnetic (Magnetic Plug) IAW TMI-2840-263-23, 72-60-00, para 4.B. Catch and measure amount of oil drained.

Amount drained less than 100 ml?

Yes

No

Reinstall bottom chip detector (magnet plug) temporarily, immediately motor engine and determine maximum available speed.

Was motoring speed satisfactory?

No

St-12 AA (Pg 3)

Yes

Complete installation of bottom magnetic plug IAW TMI-2840-263-23, 72-60-00, para 1.D.

Remove oil filter housing and check valve IAW TMI-2840-263-23, 72-60-00, para 1.D. Remove transfer tubes and inspect O-rings on both ends, as well as check valve O-rings. Reinstall oil filter housing, transfer tubes, and check valve per para 2.F., using all new O-rings and gasket.

Recheck motoring speed to verify at least minimum required Ng.

Was motoring speed satisfactory?

No

Yes

Return to service

Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).

Replace Accessory Gearbox IAW TMI-2840-263-23, 72-60-00, para 1.A. and 2.F.

- Reinstall engine IAW (Similar to TM 55-1520-248-23,Task 4-1-2).
- Service engine oil system IAW (Similar to TM 55-1520-248-23, Tasks 1-4-5 and 1-4-5.1), and TMI-2840-263-23, 72-00-00, para 8.A., Lubrication System Servicing.

Return to service

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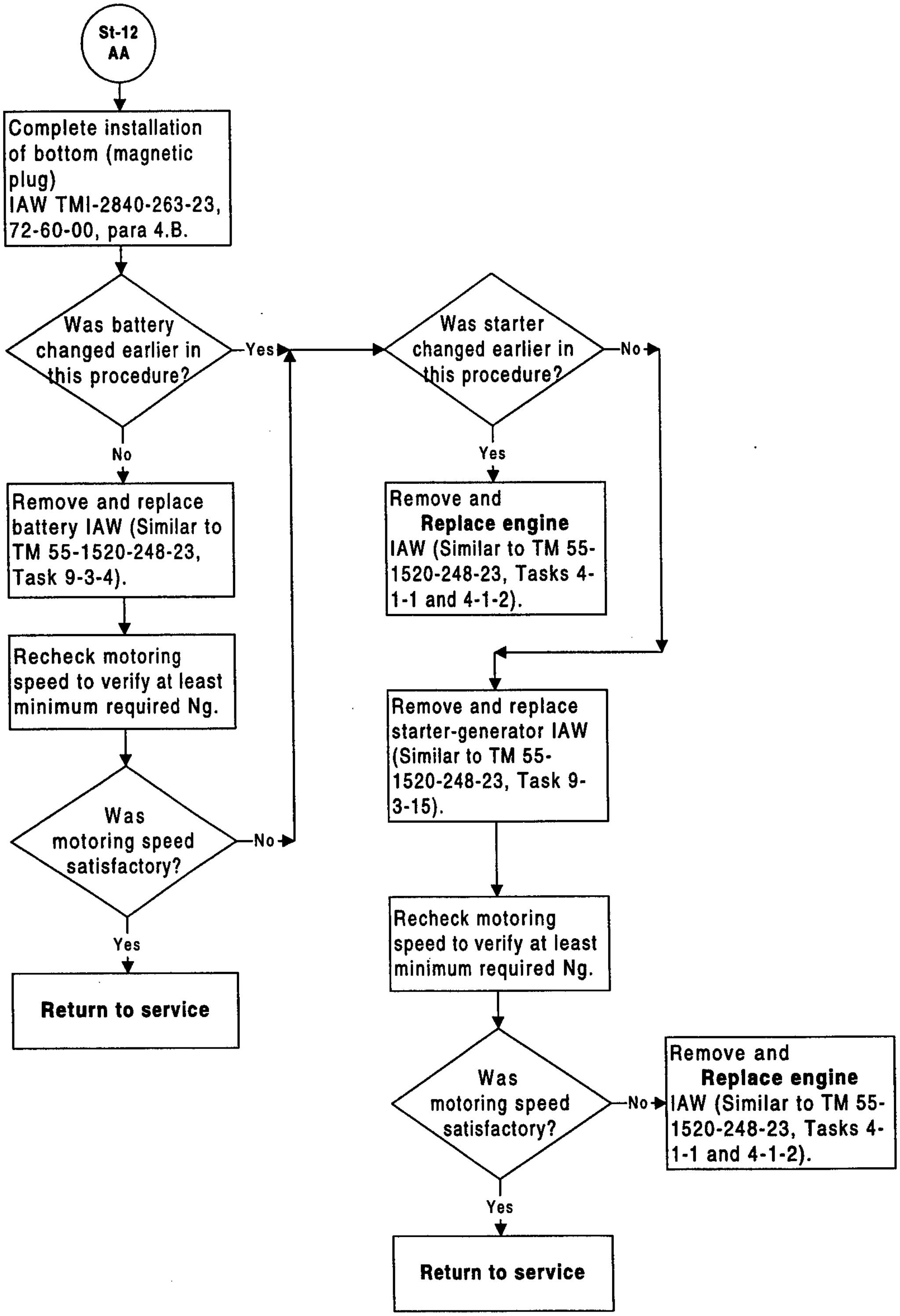
St-12. Does Not Motor To Required Light Off Speed



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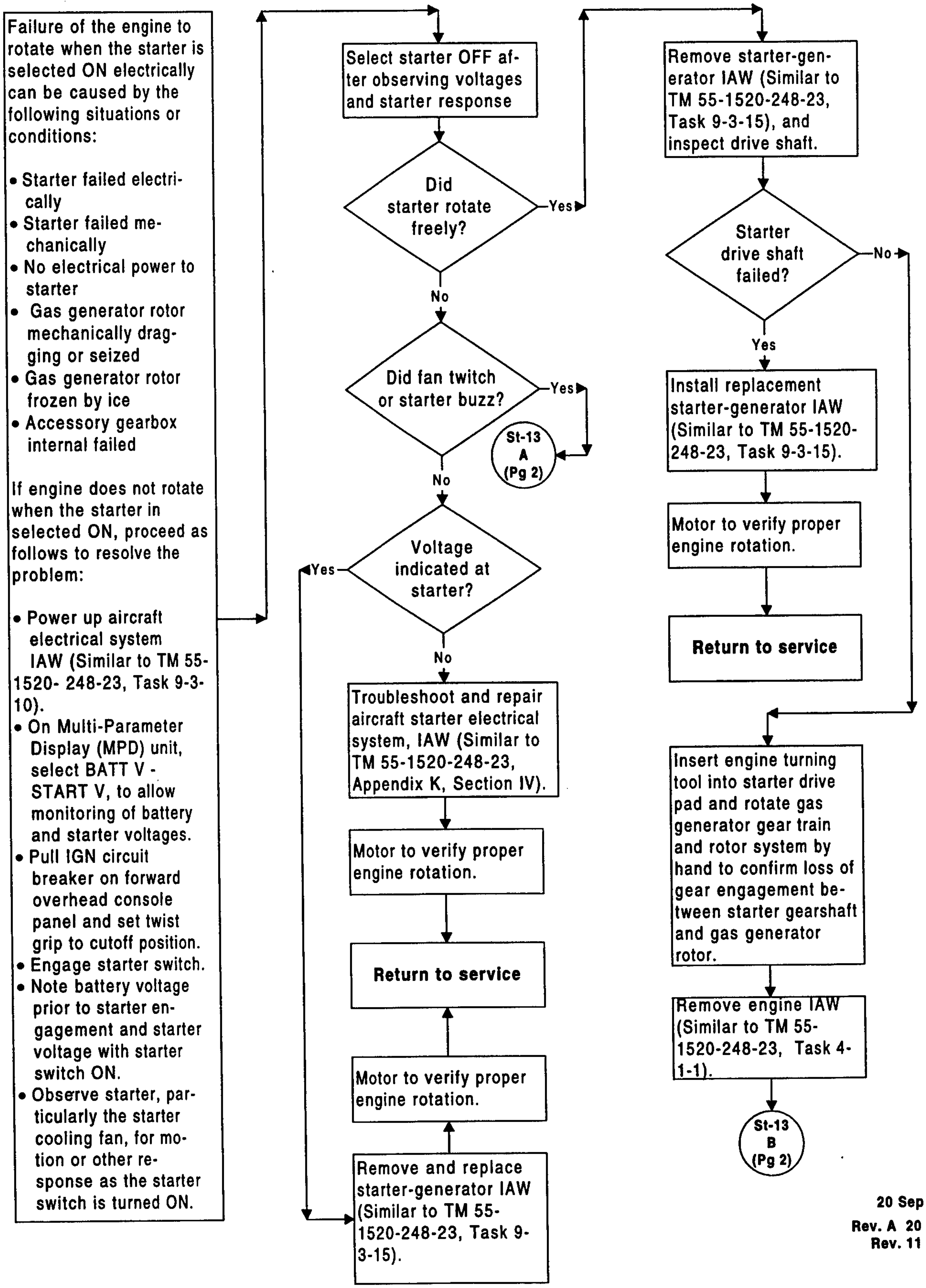
St-13. Starter Will Not Rotate Engine



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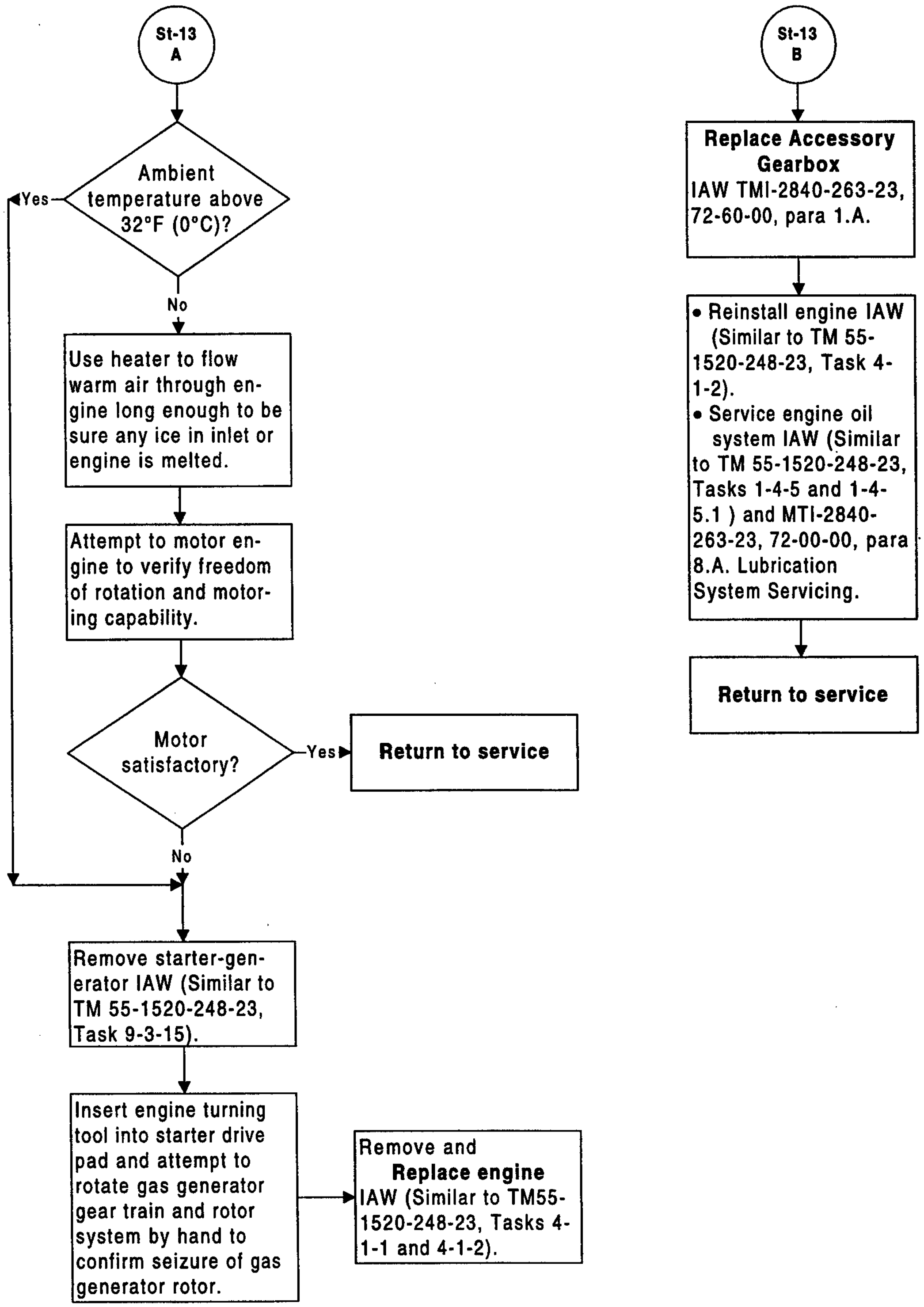
St-13. Starter Will Not Rotate Engine



R-1. Anti-icing System Operating Improperly

Several faults can affect anti-icing system function. Some leave the system ON at all times, some degrade its performance, others render it nonfunctional. These include:

- Loss of electrical power to A/I solenoid valve (results in system ON)
- A/I air valve to solenoid valve tube loose/broken (results in system ON)
- A/I air valve to front support tube loose/broken (results in reduced or no icing protection of engine inlet)
- Dirt obstructing vents at trailing edge of inlet guide vanes (results in reduced icing protection of inlet guide vanes)
- A/I solenoid valve vent port plugged or obstructed (results in system OFF)
- A/I air valve stuck closed (results in system OFF)

If anti-icing system function is in question, proceed as follows to verify and correct if required:

Test anti-icing system IAW TMI-2840-263-23, 75-10-01, para 3.A. and 3.B.
This test verifies proper system function, proper function of the A/I solenoid valve, and identifies electrical power problems.

Did A/I ON increase MGT 5° to 15°C?

Yes → **Return to service**

No →

Any MGT rise at all when A/I selected ON?

Yes → R-1 A (Pg 2)

No →

Solenoid valve function OK during system test?

Yes → R-1 B (Pg 2)

No →

Solenoid valve electrical power supply OK?

Yes → R-1 C (Pg 2)

No →

- Power down aircraft IAW (Similar to TM 55-1520-248-23, Task 9-3-11).
- Disconnect aircraft connector P16 at engine accessory harness connector J16.
- Power up aircraft IAW (Similar to TM 55-1520-248-23, Task 9-3-10).
- Using multimeter, measure DC voltage between pin U (hot) and pin T (ground) on aircraft connector.

14-28 volts DC measured?

No →

Troubleshoot and repair related aircraft electrical circuitry IAW (Similar to TM 55-1520-248-23, Appendix K, Section IV).

Retest anti-icing system IAW TMI-2840-263-23, 75-10-01, para 3.A.and 3.B.

Upon satisfactory completion

Return to service

Yes →

Troubleshoot engine accessory harness to correct continuity problem between interface connector J16, pin U, and A/I solenoid valve connector P13, pin 1, and between J16, pin T, and P13, pin 2.
If necessary, remove, test, and reinstall or replace accessory harness IAW.

TMI-2840-263-23, para 3.A., 3.B.

Retest anti-icing system IAW TMI-2840-263-23, 75-10-01, para 3,A, and 3.B.

Upon satisfactory completion

Return to service

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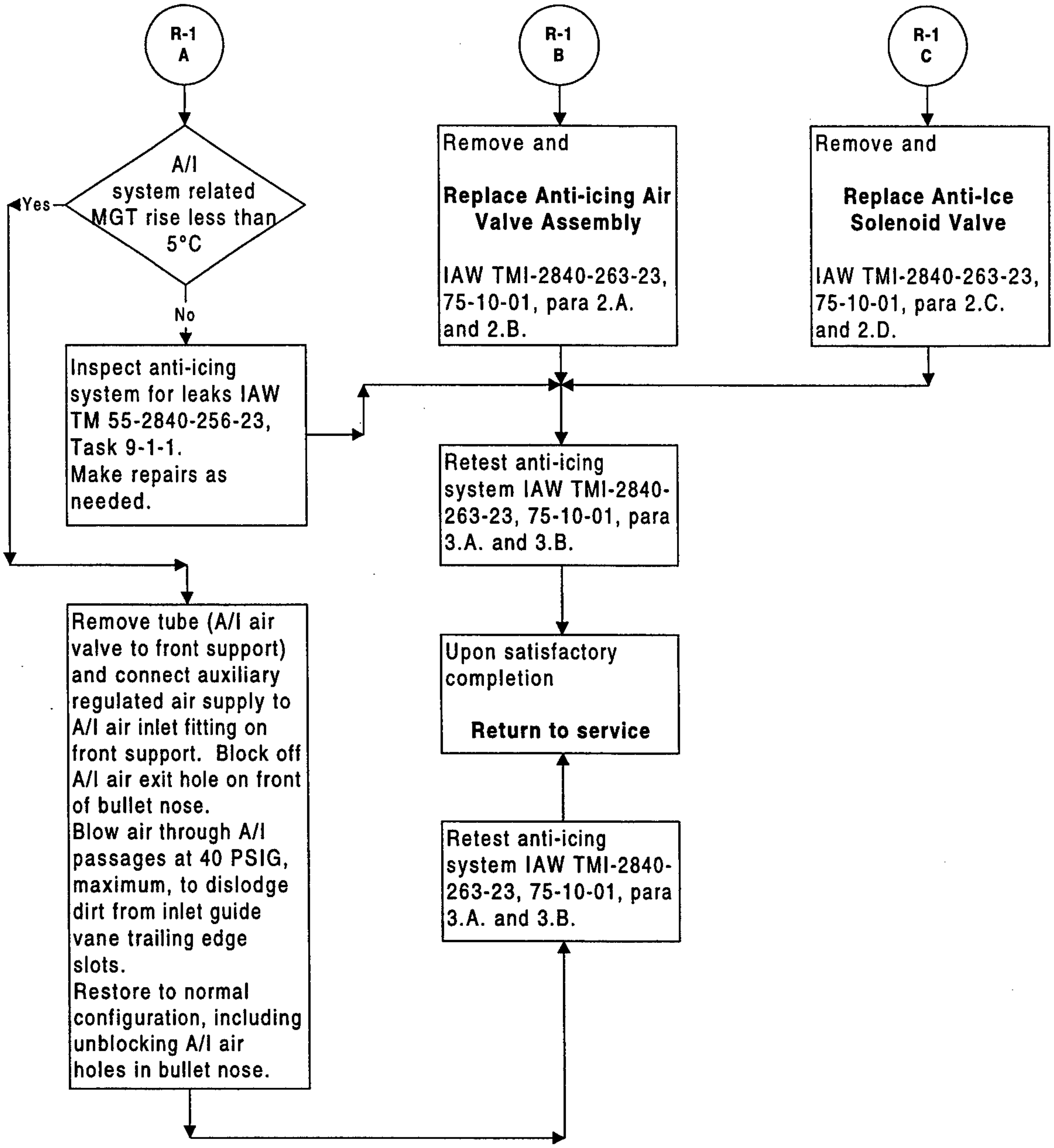
R-1. Anti-icing System Not Operating Properly



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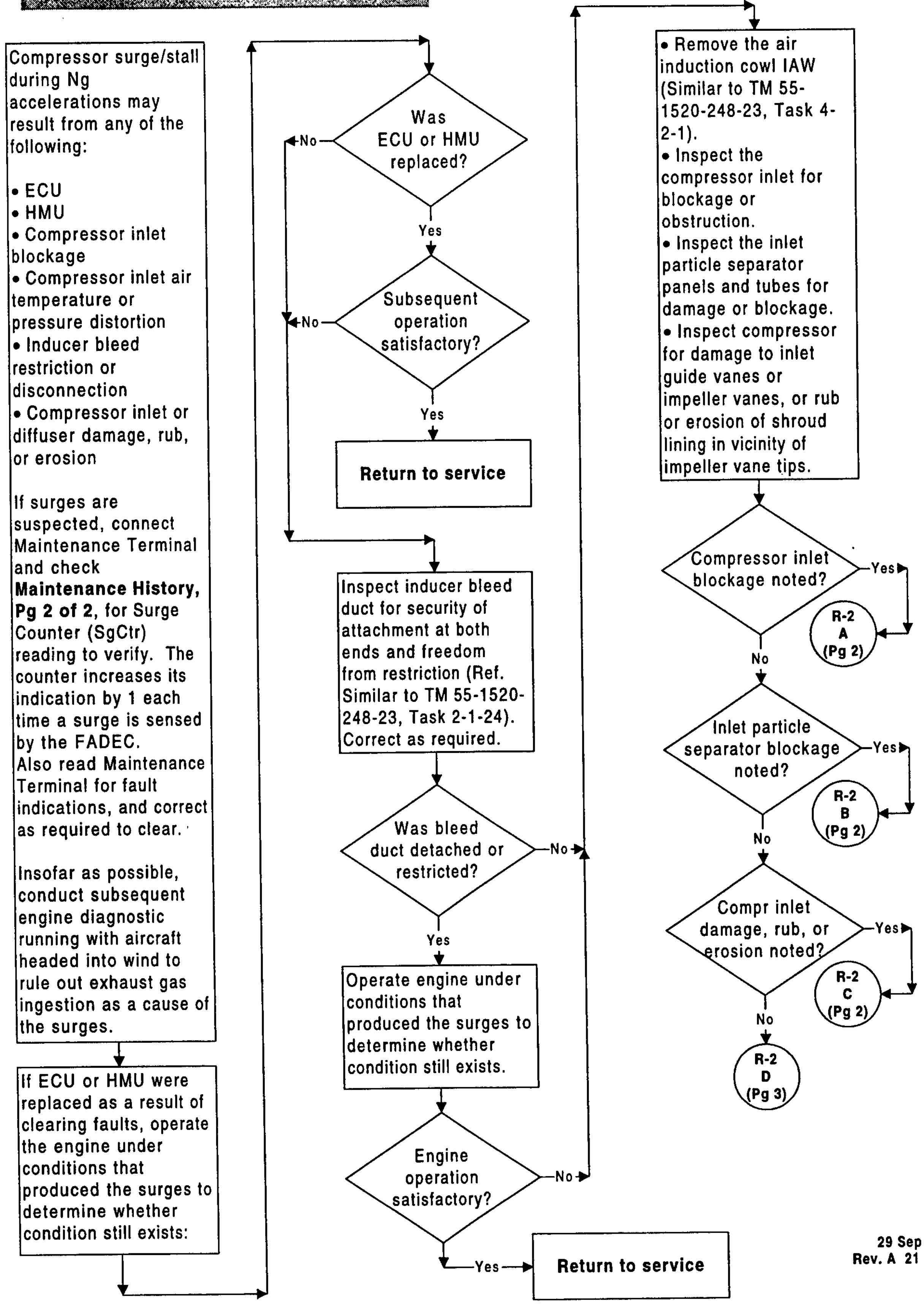
R-2. Compressor Surge/Stall



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R-2. Compressor Surge/Stall

R-2 A

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove and **replace compressor module** IAW TMI-2840-263-23, 72-30-00, para 1.a and 1.B. (This also requires removal and reinstallation of turbine module IAW TMI-2840-263-23, 72-50-00, para 1.A and 1.B.)
- Identify replaced compressor module as having been subjected to inlet blockage and send to overhaul.
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).
- As a part of the check runs accompanying engine installation Task 4-1-2, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, 72-00-00, para 1.B., Diffuser Vent Orifice Selection.

Return to service

R-2 B

Correct inlet particle separator blockage condition IAW (Similar to TM 55-1520-248-33, Tasks 4-2-8, -9, and -10).

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-10).
- Remove and **replace compressor module** IAW TMI-2840-263-23, 72-30-00, para 1.A. and 1.B. (This also requires removal and reinstallation of turbine module IAW TMI-2840-263-23, 72-50-00, para 1.A nd 1.B.)
- Identify replaced compressor module as having been subjected to inlet blockage and send to overhaul.
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).
- As a part of the check runs accompanying engine installation Task 4-1-2, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, para 1.B., Diffuser Vent Orifice Selection.

Return to service

R-2 C

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove and **replace compressor module** IAW TMI-2840-263-23, 72-30-00, para 1.A. and 1.B. (This also requiresremoval of turbine module IAW TMI-2840-263-23, 72-50-00, para 1.A and 1.B.)

The flow path must be inspected for debris and damage from particles generated by compressor:

- Remove combustion module IAW TMI-2840-263-23, 72-40-00, para 1.A. and 2.A.
- Inspect air discharge tubes, combustion outer case, and liner IAWTMI-2840-263-23, 72-40-00, para 1.C., 2.B., and 4.C., respectively.
- Inspect first stage nozzle shield, nozzle, and turbine wheel IAW TMI-2840-263-23,72-50-00, para 5.C. and 5.D.
- Install first stage nozzle shield (replace existing part if condition requires).
- If required, make repairs to outer combustion case IAW TMI-2840-263-23, 72-40-00, para 2.B. (or replace).
- If required, make repairs to combustion liner IAW TMI-2840-263-23, 72-40-00, para 1.C., (or replace).

R-2 AA (Pg 3)

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R-2. Compressor Surge/Stall

R-2 AA

• Reinstall turbine module IAW TMI-2840-263-23, 72-50-00, para 1.B., and combustion module per TMI-2840-263-23, 72-40-00, para 1.B. and 2.A.
• Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).
• As a part of the check runs accompanying engine installation Task 4-1-2, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, 72-00-00, para 1.B., Diffuser Vent Orifice Selection.

Return to service

R-2 D

This branch considers compressor diffuser damage not visible externally:
• Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
• Remove and **replace compressor module** IAW TMI-280-263-2372-30-00, para 1.A. and 1.B. (This also requires removal of turbine module IAW TMI-2840-263-23, 72-50-00, para 1.A and 1.B.)

The flow path must be inspected for debris and damage from particles generated by compressor:
• Remove combustion module IAW TMI-2840-263-2372-40-00, para 1.A and 1.B.
• Inspect air discharge tubes, combustion outer case, and liner IAW TMI-2840-263-23, 72-40-00, para 1.C.,2.B. and 4.C. respectively.
• Inspect first stage nozzle shield, nozzle, and turbine wheel IAW TMI-2840-263-23, 72-50-00, para 5.C. and 5.D.
• Install first stage nozzle shield (replace existing part if condition requires).
• If required, make repairs to outer combustion case IAW TMI-2840-263-23, 72-40-00, para 2.B. (or replace).
• If required, make repairs to combustion liner IAW TMI-2840-263-23, 73-40-00, para 1.C. (or replace).

• Reinstall turbine module IAW TMI-2840-263-23, 72-50-00, para 1.B., and combustion module per TMI-2840-263-23, 72-40-00, para 1.B. and 2.A.
• Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).
• As a part of the check runs accompanying engine installation Task 4-1-2, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-263-23, 72-00-00, para 1.B., Diffuser Vent Orifice Selection.

Return to service

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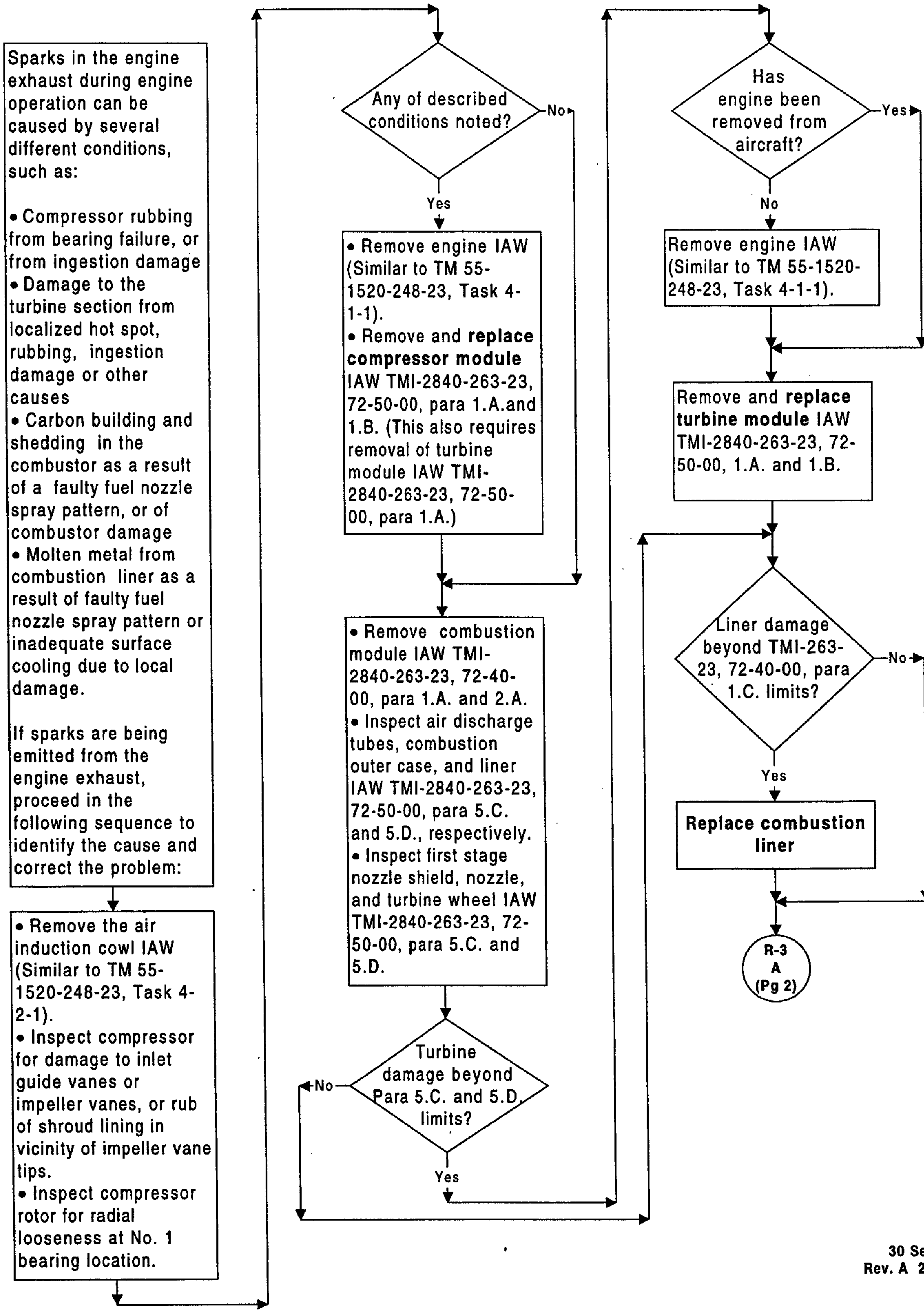
R-3. Exhaust Duct Emitting Sparks



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R-3. Exhaust Duct Emitting Sparks

R-3
A

- Reinstall first stage nozzle shield (replace existing part if condition requires) Ref. TMI-2840-263-23, 72-50-00, para 5.D.
- If required, make repairs to outer combustion case IAW TMI-2840-263-23, 72-40-00, para 2.B. (or replace).
- If required, make repairs to combustion liner IAW TMI-2840-263-23, 72-40-00, para1.C. (or replace).

Reinstall combustion module IAW TMI-2840-263-23, 72-40-00, para 1.B. and 2.A.

Has engine been removed from aircraft?

No

Yes

Reinstall engine IAW TMI-2840-263-23, 72-40-00, para 1.B. and 2.A.

Remove fuel nozzle, and inspect, service, and inspect flow pattern IAW TMI-2840-263-23, 73-10-03, para 1.A., 2.A. and 3.A., respectively.

Fuel nozzle flow pattern OK?

No

Replace fuel nozzle
Install replacement nozzle IAW TMI-2840-263-23, 73-10-03, para 1.A. and 1.B.

Yes

Install fuel nozzle IAW TMI-2840-263-23, 73-10-03, para 1.B.

Was compressor replaced during this sequence?

No

Return to service

Yes

As a part of the check runs accompanying engine installation (TMI-2840-263-23, 72-00-00, para 1.B. 1.A., Operating Instructions Task 4-1-2), check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove, and replace orifice with another size, IAW TMI-2840-263-23, 72-00-00, para 1.B. Diffuser Vent Orifice Selection.

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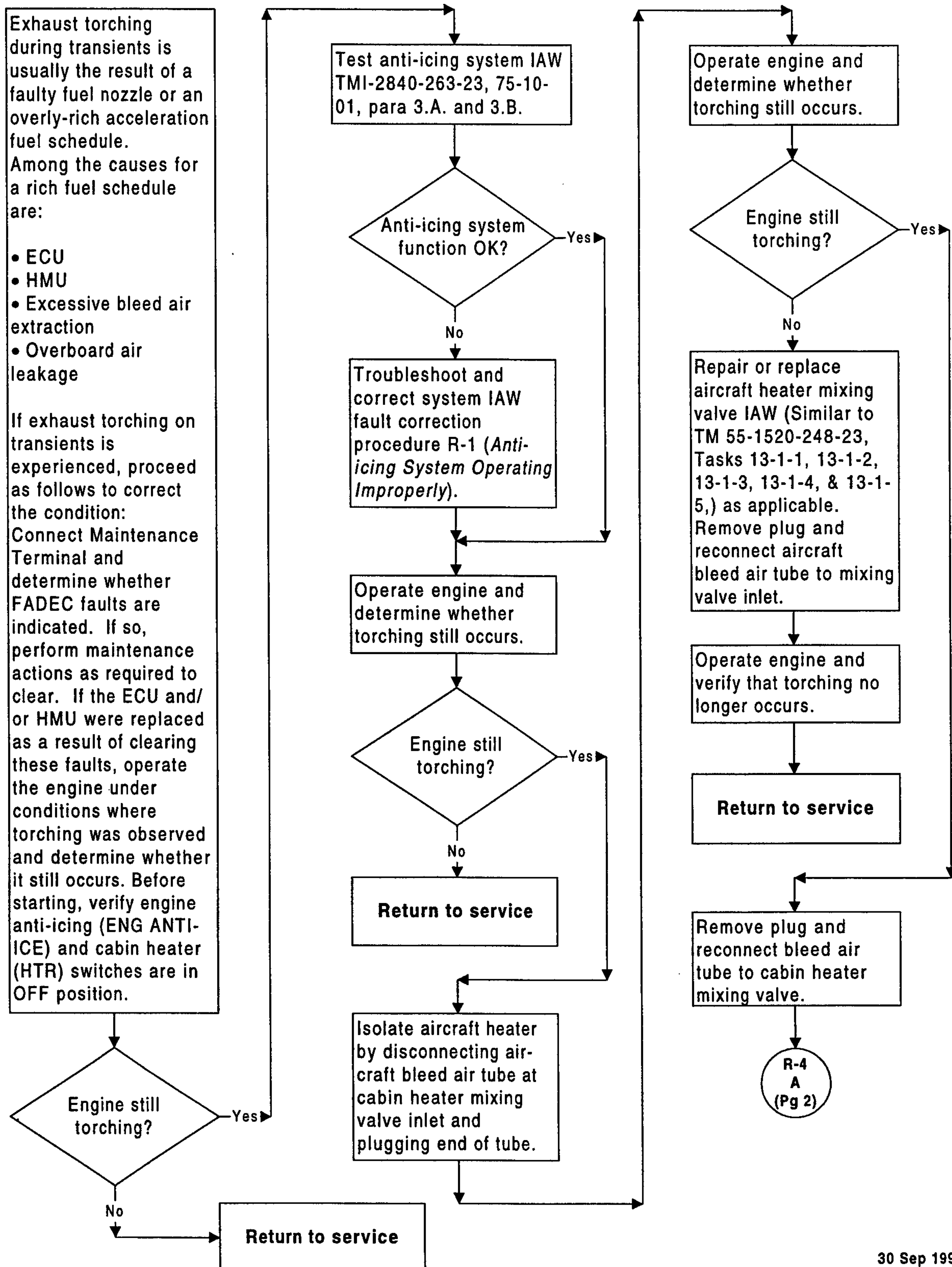
R-4. Exhaust Torching During Transients



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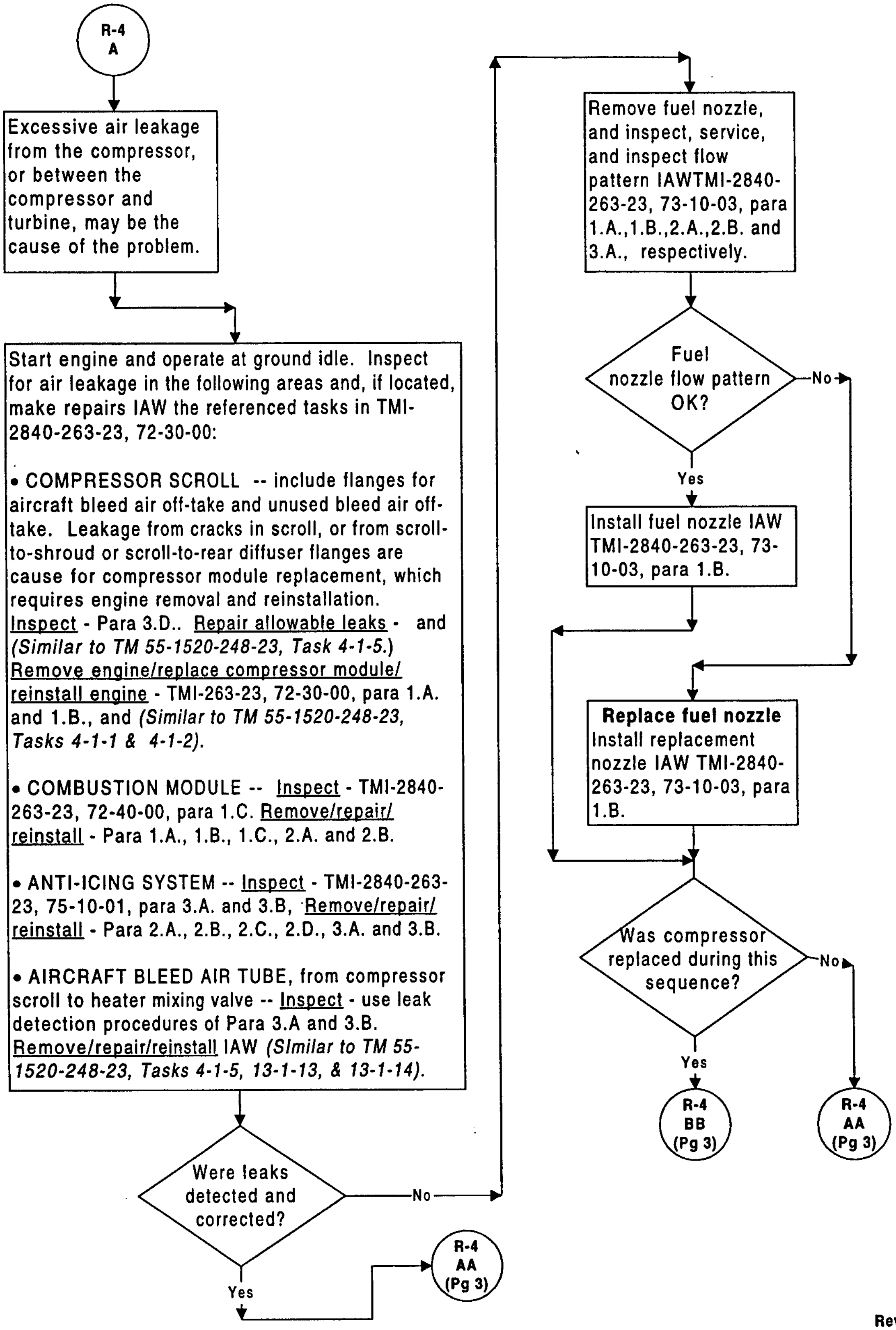
R-4. Exhaust Torching During Transients



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R-4. Exhaust Torching During Transients

R-4 AA

Operate engine and verify that torching no longer occurs.

Return to service

R-4 BB

As a part of the check runs accompanying engine installation TMI-2840-263-23, 72-00-00, para 1.A., Check Run, Operating Instructions. Check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, 72-00-00, para 1.B., Diffuser Orifice Selection.

Operate engine and verify that torching no longer occurs.

Return to service

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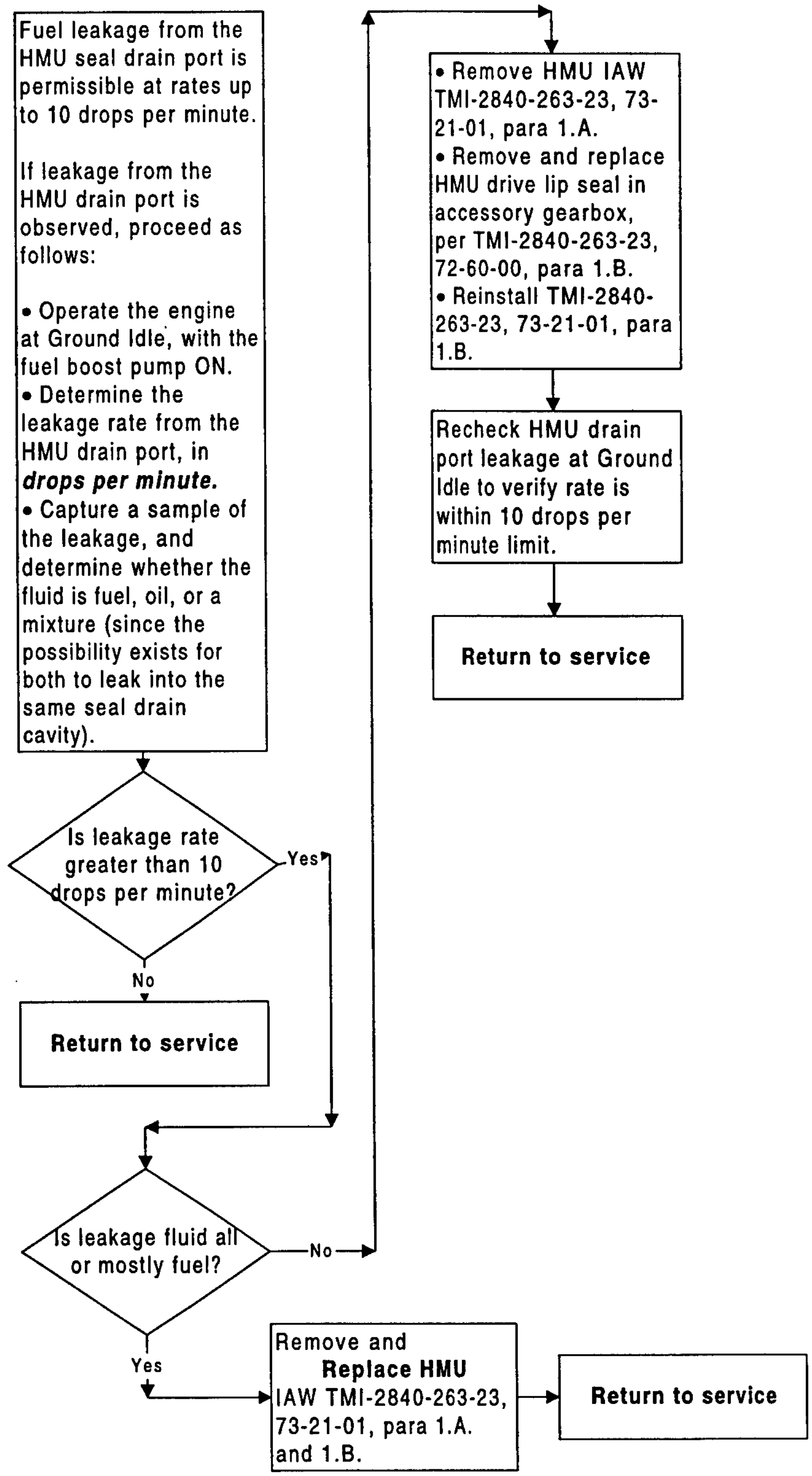
R-5. Fuel Leaking From HMU Overboard Drain Port



30 Sep 1997
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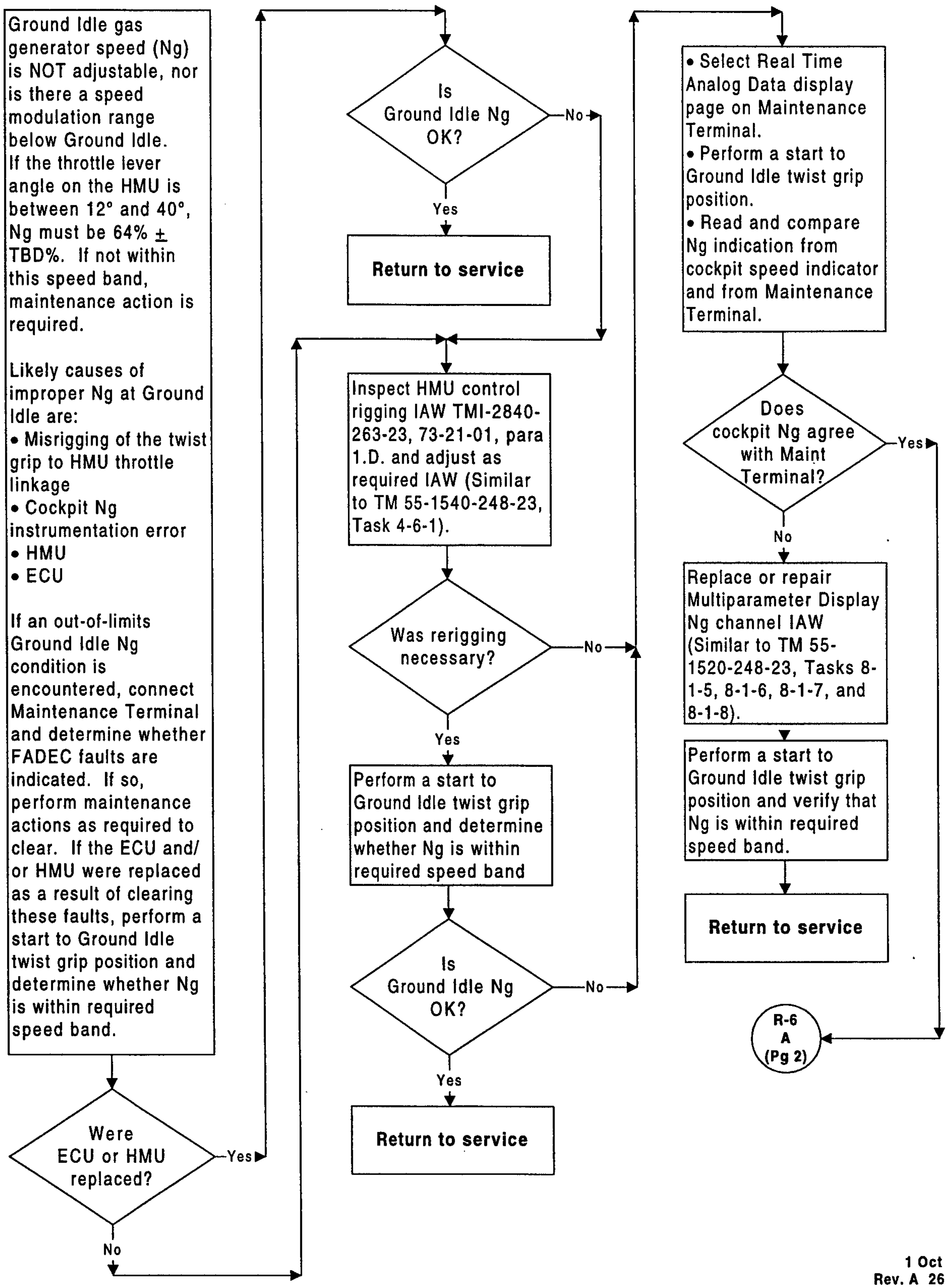
R-6. Ground Idle Speed Too High Or Too Low



1 Oct 1997
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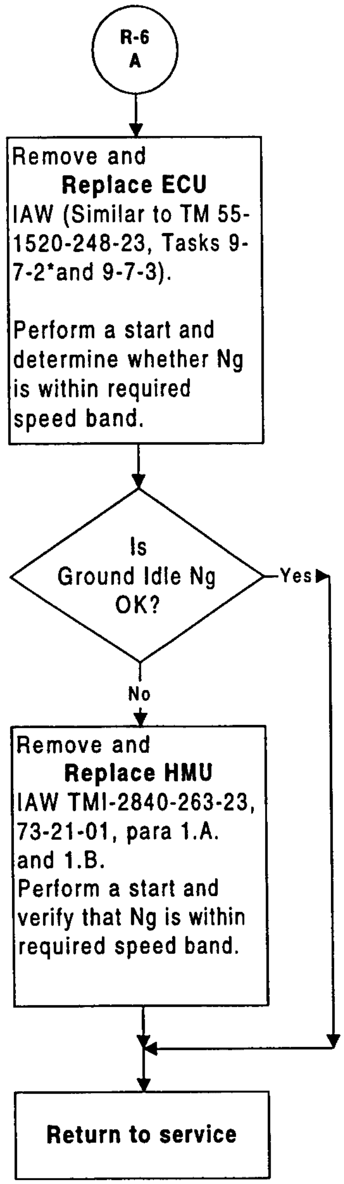
R-6. Ground Idle Speed Too High Or Too Low



1 Oct 1997
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R-7. Magnetic Chip Detector Warning

The engine is fitted with two magnetic chip detectors, ***upper*** and ***lower***. Oil scavenged from the accessory gearbox, which includes all accessory gears and bearings, plus the following main bearings, flows past the ***lower*** chip detector.

- No.2 (rear compressor)
- No. 2½ (spur adapter gearshaft)
- Nos. 3 and 4 (power train pinion gear)
- No. 5 (front power turbine)

Oil flowing past the ***upper*** chip detector comprises **all** oil scavenged from the engine, including the oil that has already flowed past the ***lower*** chip detector plus oil from the following main bearings:

- No. 1 (front compressor)
- No. 6 (rear power turbine)
- No. 7 (front GG turbine)
- No. 8 (rear GG turbine)

The non-fuzz-burning chip detectors are connected through the engine accessory harness to an aircraft harness, which transmits chip indications to the Multifunction Display (MFD).

The following sequence presents actions to be taken if engine chip detector *CAUTIONS* are displayed on the MFD.

Disconnect engine accessory harness connector from chip detector(s) currently giving chip indication.

Did chip indication on MFD turn OFF?

Yes

No

Disconnect aircraft interface connector P16 from the engine accessory harness connector J16.

Did chip indication on MFD turn OFF?

Yes

No

Troubleshoot aircraft wiring (similar to TM 55-1520-248-23, Appendix K, Section IV).

Remove and **Replace engine accessory harness** IAW TM 1-2840-263-23, 73-21-00, para 3.A. and 3.B.

R-7 A (Pg 2)

The below circumstances are cause for engine removal or replacement:

- Four chip detector indications in the last 50 hours of engine operation

OR

- A chip detector indication within eight engine operating hours following a post-chip-detection maintenance check run, where a second 30 minute run was necessitated by an indication on the first 30 minute run

Do either of these cases apply?

No

Yes

- Remove and **Replace engine** (similar to TM 55-1520-248-23, Tasks 4-1-1 and 4-1-2).
- Service aircraft portion of engine oil system IAW TM 1-2840-263-23, 72-00-00, para 8.A., Lubrication System Servicing, as applicable.

R-7 B (Pg 2)

2 Oct 1997
Rev. A 27 Jan 1998

R-7. Magnetic Chip Detector Warning

R-7 A

- Remove, service, and install chip detectors per TM 1-2840-263-23, 72-60-00, para 4.B.
- In log book, note event as ***False Indication.***

Return to service

R-7 B

Remove and inspect side and bottom chip detectors IAW TM 1-2840-263-23, 72-60-00, para 4.B.

Particle sizes or counts exceed limits?

Yes

- Remove and **Replace engine** (similar to TM 55-1520-248-23, Tasks 4-1-1 and 4-1-2).
- Service aircraft portion of engine oil system IAW TM 1-2840-263-23, 72-00-00, para 8.A., Lubricating System Servicing, as applicable.

No

- Service and install chip detectors, and perform a 30 minute ground run IAW TM 1-2840-256-23, 72-60-00, para 4.B.

If chips are encountered during the 30 minute run (that do not exceed size or count limits):

- Remove, clean, and reinstall chip detectors per para 4.B.
- Clean engine oil filter per para 1.C.
- Service aircraft portion of engine oil system per TM 1-2840-263-23, 72-00-00, para 8.A., Lubricating System Servicing, as applicable.
- Make a second 30 minute ground run per TM 1-2840-256-23, 72-60-00, para 4.B.

Was a second 30 minute run required?

No

Yes

Chip indication during second run?

No

Yes

- Remove and **Replace engine** (similar to TM 55-1520-248-23, Tasks 4-1-1 and 4-1-2).
- Service aircraft portion of engine oil system IAW TM 1-2840-263-23, 72-00-00, para 8.A., Lubricating System Servicing, as applicable.

- Remove, inspect, service, and install chip detectors IAW TM 1-2840-263-23, 72-60-00, para 4.B.

Return to service

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R-8. Low Measured MGT At Normal Or High Power

Abnormally low measured MGT with other engine parameters (such as Ng and torque) being in the normal range is usually caused by such items as:

- Aircraft MGT indicator
- Engine thermocouple harness
- Engine electrical harness
- Engine accessory harness

If an abnormally low MGT condition is encountered, proceed as follows to correct:

Connect Maintenance Terminal and determine whether FADEC faults are indicated. If so, perform maintenance actions as required to clear. If the MGT harness, the engine electrical harness, or the engine accessory harness were replaced as a result of clearing these faults, make an engine run to determine whether MGT now appears normal.

MGT or other engine harnesses replaced?

Yes

No

MGT indication satisfactory?

Yes

Return to service

No

Field-check the calibration of the cockpit MGT indicator as follows:

- Remove the two nuts from the MGT harness terminal block studs and lift off MGT harness leads and engine electrical harness leads (but leave signal leads from engine accessory harness attached to the studs).
- Using Thermocouple Calibrator (OMEGA Model CL-300-1000C-K [TBD] or equivalent), attach the chromel lead of the calibrator to the chromel terminal stud and the alumel calibrator lead to the alumel terminal block stud.
- Reinstall the stud nuts, and torque to 18-24 in.-lb.
- Power up the aircraft with battery or APU.
- Set thermocouple calibrator to 800°C (1472°F) and observe and record MGT value displayed on the cockpit MGT indicator.
- Repeat above steps at calibrator settings of 700°C (1292°F) and 600°C (1112°F).
- MGT indications from cockpit digital MGT indicator should agree with the thermocouple calibrator within ± TBD °C (± TBD°F).

Cockpit MGT indicator agrees with calibrator?

No

R-8 A (Pg 2)

Yes

Remove and replace **Engine Thermocouple Harness** IAW TM 1-2840-263-23, 77-20-01, para 1.A. and 1.B.

Remove calibrator and reconnect MGT harness leads to terminal block, along with engine electrical and accessory harness MGT leads, and torque stud nuts to 18-24 in.-lb.

Make an engine run to verify that MGT appears normal.

Return to service

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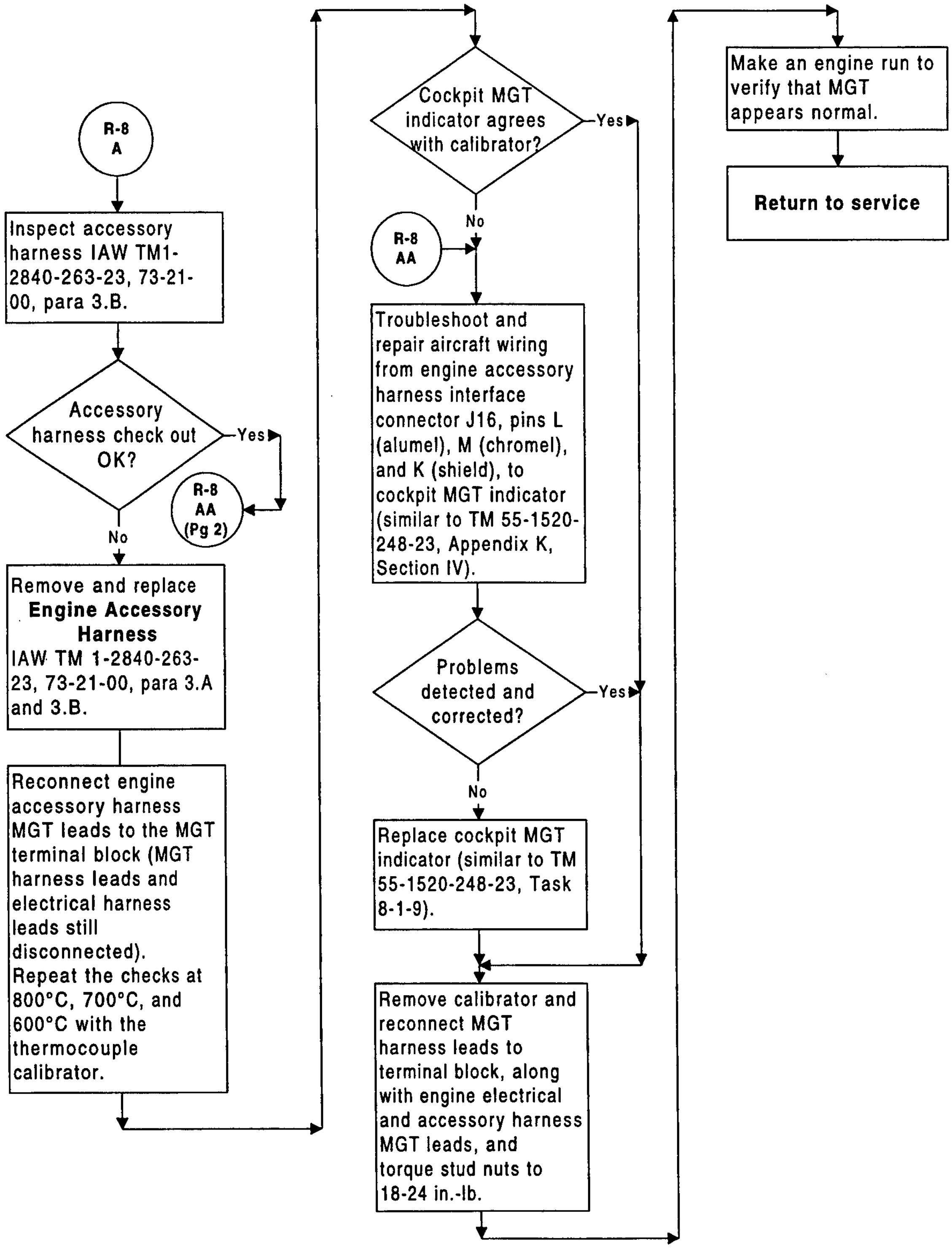
R-8. Low Measured MGT At Normal Or High Power



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R-9. Ng Or Np Overspeed

Allowable operating limits for gas generator speed (Ng) and power turbine speed (Np), and maintenance actions required upon limits exceedences, are as follows:

GAS GENERATOR SPEED (Ng)

- **Above 106%** *or*
- **105%-106% over 10 seconds**

Repair/overhaul compressor and turbine

POWER TURBINE SPEED (Np)

- **Above 119% (or maximum indication of Np speed indicator),** *or*
- **Any time complete loss of output shaft load occurs,** *or*
- **Any time maximum allowable Np (adjusted for torque) is exceeded,** *or*
- **Any time continuous allowable Np (adjusted for torque) is exceeded for more than 15 seconds**

Repair/overhaul turbine and gearbox

It is possible, particularly during extreme transient maneuvers, during operation in the FADEC manual mode, or in an event such as an output shaft failure, to exceed these limits.

The ECU captures overspeed events in its memory, the magnitude of which can be accessed with the Maintenance Terminal.

If Ng or Np overspeeds occurred or are suspected, proceed as follows to resolve:

Connect the Maintenance Terminal and select the Maintenance History display. Read out the values of the following parameters:

NgLmPk -- the highest Ng reached, if above 106%
NgLmTm -- the time (sec.) above 106% Ng
NgRLmPk -- the highest Ng reached, if above 105%
NgRLmTm -- the time (sec.) greater than 10 seconds that Ng exceeded 105%
NpQNppkExLm -- the highest Np reached if above maximum allowable Np (adjusted for torque)
NpQNppkRnLm -- the highest Np reached above the continuous allowable Np (adjusted for torque) limit if exceeded for more than 15 seconds

If **NgLmPk** is greater than 106%, or if **NgRLmTm** is greater than 0.000 seconds, a gas generator overspeed has occurred.

If **NpQNppkExLm** or **NpQNppkRnLm** show values above 107% Np, a power turbine overspeed has occurred.

Ng overspeed indicated by Maint Terminal?

Yes:

- Remove engine (similar to TM 55-1520-248-23, Task 4-1-1).
- Remove and replace **Compressor module** IAW TM 1-2840-263-23, 72-30-00, para 1.A. and 1.B.
- Remove and replace **Turbine module** IAW TM 1-2840-263-23, 72-50-00, para 1.A and 1.B.
- Identify replaced compressor and turbine modules as having been subjected to Ng overspeed and send to overhaul.
- Reinstall engine (similar to TM 55-1520-248-23, Task 4-1-2).
- Clear any remaining maintenance faults not addressed by module changes.
- As a part of the check runs accompanying engine installation Task 4-1-2, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TM 1-2840-263-23, 72-00-00, para 1.B., Diffuser Vent Orifice Selection.

Return to service

No:

Np overspeed indicated by Maint Terminal?

Yes: R-9 A (Pg 2)

No: R-9 B (Pg 2)

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R-9. Ng Or Np Overspeed

P-9 A

• Remove engine (similar to TM 55-1520-248-23, Task 4-1-1).
• Remove and replace **Accessory gearbox module** IAW TM 1-2840-263-23, 72-60-00, para 1.A.
• Remove and replace **Turbine module** IAW TM 1-2840-263-23, 72-50-00, para 1.A. and 1.B.
• Identify replaced accessory gearbox and turbine modules as having been subjected to Np overspeed and send to overhaul.
• Reinstall engine (similar to TM 55-1520-248-23, Task 4-1-2).
• Clear any remaining maintenance faults not addressed by module changes.
• As a part of the check runs accompanying engine installation Task 4-1-2, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TM 1-2840-263-23, 72-00-00, para 1.B., Diffuser Vent Orifice Selection.

Return to service

P-9 B

If overspeed not confirmed by Maintenance Terminal, a cockpit speed indicator fault was probably the cause of the overspeed indication. Proceed as follows to correct.

• Perform maintenance actions required to clear any faults indicated by Maintenance Terminal.
• Select Maintenance Terminal Real Time Analog Data display page.
• Operate engine at light-on-skids power (at 100% Np/Nr).
• Read and compare Ng and Np indications from cockpit speed indicator and from Maintenance Terminal.

IF PROBLEM IS Ng:
Replace or repair Multiparameter Display Ng channel (similar to TM 55-1520-248-23, Tasks 8-1-5, 8-1-6, 8-1-7, and 8-1-8).

IF PROBLEM IS Np:
Replace or repair Dual Tachometer Np channel (similar to TM 55-1520-248-23, Tasks 8-1-12, -13, and -14).

Perform a check run to verify cockpit speed indicators agree with Maintenance Terminal speeds.

Return to service

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R-10. Ng Or Np Speed Not Indicating

Engine rotor speed signals (Ng and Np) are each generated by dual channel sensors located in the engine accessory gearbox. Either channel can supply the control system requirements, and logic within the FADEC allows it to detect and reject a faulty channel, and switch to the other, without functional impairment.

The engine speed indicators in the cockpit share channel No. 2 on each speed sensor with the FADEC. If sensor channel No. 2 fails, there is no capability to use the alternate channel -- the result being loss of cockpit engine speed indication for the engine rotor system involved.

If cockpit speed indication is lost or erratic as a result of sensor failure, it will result in an Ng or Np fault indication on the Maintenance Terminal. If the aircraft wiring or speed indicator is responsible, there will be no Maintenance Terminal fault indication.

To correct the problem, proceed as follows:

Connect Maintenance Terminal and determine whether FADEC faults are indicated. If so, perform maintenance actions as required to clear. If, as the result of a fault indication(s), any of the following were replaced:
- ECU
- Engine Electrical Harness
- Speed Sensor on channel experiencing cockpit speed indication problem

perform a start and determine whether the cockpit speed indication problem still exists.

Any of referenced parts replaced? — No / Yes

Speed indication OK on following start? — No / Yes

Return to service

- Disconnect engine electrical harness connector J6 (Np) or P7 (Ng), as applicable.
- Connect a frequency generator [TBD] across engine electrical harness connector J6 sockets D and E (Np) or connector P7 pins TBD and TBD (Ng).
- Perform following with aircraft powered up IAW (Similar to TM 55-1520-248-23, Task 9-3-10).
- Feed a frequency (in range noted below) into the specified pins/ sockets of the engine electrical harness connector. Note frequency and resulting reading on cockpit speed indicator:

-- CONTINUED -- ABOVE

CONTINUED FROM -- BELOW --

Np:
Frequency -- 9500 to 10500 Hz
Desired Cockpit Speed Indication (in %) = Freq. x .0097879

Ng:
Frequency -- 17000 to 18000 Hz
Desired Cockpit Speed Indication (in %) = Freq. x .0056022

Did cockpit indicator read correctly? — No / Yes

R-10 B (Pg 2)

Check speed sensor connector and mating engine electrical harness connector for bent or recessed pins or sockets, or other damage.

Connector damaged? — No / Yes

Replace component with damaged connector (speed sensor, engine electrical harness, or both)

R-10 A (Pg 2)

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R-10. Ng Or Np Speed Not Indicating

R-10 A

Perform a start and determine whether the cockpit speed indication problem is corrected.

Speed indication OK?

No → R-10 AA (Pg 2)

Yes → **Return to service**

R-10 B

- Reconnect engine electrical harness connector to speed sensor.
- Disconnect connector P2 from ECU (aircraft wiring to cockpit speed indicators, among other things).
- Connect a frequency generator [TBD] across aircraft connector P2 pins 74 and 75 (Np) or pins 76 and 77 (Ng).
- Power up aircraft IAW (Similar to TM 55-1520-248-23, Task 9-3-10).
- Feed a frequency (in range noted below) into the specified pins of the aircraft connector. Note frequency and resulting reading on cockpit speed indicator:

-- CONTINUED -- ABOVE

CONTINUED FROM -- BELOW --

Np:
Frequency -- 9500 to 10500 Hz
Desired Cockpit Speed Indication (in %) = Freq. x .0097879

Ng:
Frequency -- 17000 to 18000 Hz
Desired Cockpit Speed Indication (in %) = Freq. x .0056022

Did cockpit indicator read correctly?

Yes → R-10 BB (Pg 3)

No → Troubleshoot aircraft wiring from connector P2 (at ECU) to the cockpit speed indicators, IAW (Similar to TM 55-1520-248-23, Appendix K, Section IV).

Wiring problems detected and corrected?

No → R-10 AA

Yes → Perform a start and verify that the cockpit speed indication problem is corrected. → **Return to service**

R-10 AA

IF PROBLEM IS Ng:
Replace or repair Multiparameter Display Ng channel IAW (Similar to TM 55-1520-248-23, Tasks 8-1-5, 8-1-6, 8-1-7, and 8-1-8).
IF PROBLEM IS Np:
Replace or repair Dual Tachometer Np channel IAW (Similar to TM 55-1520-248-23, Tasks 8-1-12, -13, and -14).

Perform a start and verify that the cockpit speed indication problem is corrected.

Return to service

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R-10. Ng Or Np Speed Not Indicating

R-10 BB

Reconnect aircraft connector P2 to ECU.

Has ECU been replaced during this sequence?

No →

- Disconnect interface harness connector P1 from ECU (connection from engine electrical harness to ECU).
- Connect a frequency generator [TBD] across ECU connector J1 sockets 24 and 25 (Np) or sockets 36 and 37 (Ng).
- Power up aircraft IAW (Similar to TM 55-1520-248-23, Task 9-3-10).
- Feed a frequency (in range noted below) into the specified sockets of the ECU connector. Note frequency and resulting reading on cockpit speed indicator:

Np:
Frequency -- 9500 to 10500 Hz
Desired Cockpit Speed Indication (in %) = Freq. x .0097879

Ng:
Frequency -- 17000 to 18000 Hz
Desired Cockpit Speed Indication (in %) = Freq. x .0056022

Did cockpit indicator read correctly?

No →

Remove and replace **ECU** IAW (Similar to TM 55-1520-248-23, Tasks [*do not exist* -- should be similar to 9-7-2 and 9-7-3 but written to address ECU).

Perform a start and verify that the cockpit speed indication problem is corrected.

Return to service

Yes →

Reconnect interface harness connector P1 to ECU.

Yes →

- Disconnect interface harness connector J3 from engine electrical harness connector P3.
- Connect a frequency generator [TBD] across interface connector J3 sockets c and d (Np) or sockets S and T (Ng).
- Power up aircraft IAW (Similar to TM 55-1520-248-23, Task 9-3-10).
- Feed a frequency (in range noted below) into the specified sockets of the interface harness connector. Note frequency and resulting reading on cockpit speed indicator:

Np:
Frequency -- 9500 to 10500 Hz
Desired Cockpit Speed Indication (in %) = Freq. x .0097879

Ng:
Frequency -- 17000 to 18000 Hz
Desired Cockpit Speed Indication (in %) = Freq. x .0056022

R-10 AAA (Pg 3)

R-10 AAA

Did cockpit indicator read correctly

Yes → R-10 BBB (Pg 4)

No →

Troubleshoot aircraft interface harness from connector P1 (at ECU end) to connector J3 (at the engine electrical harness end), IAW (Similar to TM 55-1520-248-23, Appendix K, Section IV).

Perform a start and verify that the cockpit speed indication problem is corrected.

Return to service

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R-10. Ng Or Np Speed Not Indicating

R-10
BBB

↓

Remove and replace **Engine Electrical Harness** IAWTMI-2840-263-23, 73-21-00, para 2.A. and 2.B.

↓

Perform a start and verify that the cockpit speed indication problem is corrected.

↓

Return to service

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R-11. Oil Consumption High (Exceeding One Quart Per Five Hours Engine Operation)

Engine oil consumption is normally quite low. An oil usage rate in excess of one quart in five hours is indicative of a problem and requires corrective action.

Primary sources of oil consumption are:
- ***External***, from such places as lube system tubes and fittings, oil tank, oil cooler, scavenge oil filter, and accessory gearbox output shaft and accessory drive lip seals. External oil leaks can be detected visually and most can be repaired without engine removal.
- ***Gas path***, from locations such as the front compressor carbon seal, the power turbine No. 5 labyrinth seal, or the accessory gearbox breather vent. These leaks are generally detectable from oil puddling or wetting of adjacent surfaces.
- ***Internal***, into various internal cooling air or pressure balance cavities, resulting from labyrinth seal wear or rubbing, coking and blockage of oil scavenge passages, or degradation of oil scavenge pump capacity. These conditions, the most hazardous to engine health, can usually be detected by continuous smoking from the engine exhaust.

If oil consumption exceeds one quart in five hours, or has increased suddenly, visually inspect the engine, lube system, and drains.

External oil leakage or drainage noted?

Yes →

Locate source(s) of leakage and correct as follows:
- **TUBE ENDS, HOSE ENDS, FITTINGS, ETC.** -- tighten as required
- **EXTERNAL LUBE SYSTEM COMPONENTS** -- repair or replace IAW (Similar to TM 55-1520-248-23:
  Oil tank -- Tasks 4-4-1 through 4-4-8
  Oil cooler bypass valve -- Task 4-4-9
  Oil scavenge filter -- Task 4-4-18)
- **ENGINE ACCESSORY DRIVE LIP SEALS** -- replace IAW TMI-2840-263-23, 72-60-00, para 1.B.
  Associated accessory remove/reinstall tasks:
  HMU -- TMI-2840-263-23, 73-21-01, para 1.A. and 1.B.
  PMA -- [***no tasks written yet***]
  STARTER-GENERATOR -- (Similar to TM 55-1520-248-23, Task 9-3-15)
- **OUTPUT DRIVE LIP SEALS** -- (Similar to TM 55-1520-248-23, Task 4-1-9)

Perform check run to verify leakage corrected

Return to service

No →

Oil from three sources can leak into the exhaust collector flow path and result in excessive oil consumption:
- The compressor diffuser vent enters the exhaust collector on the left forward side. Excessive oil wetness indicates improperly sized orifice.
- The gearbox breather vents into the exhaust collector on the right forward side. Excessive oil wetness indicates a leaking breather gearshaft lip seal or extremely high gearbox internal breather pressure.
- Buffer air from the no. 5 labyrinth seal vents into the exhaust collector. Excessive laby seal clearance or inadequate buffer air pressure result in oil leaking into the inner hub fairing and forming puddles in the bottom of the exhaust collector.

Inspect the exhaust collector flow path and determine whether any of these conditions exist.

Compressor diffuser vent leaking?
- Yes → R-11 A (Pg 2)
- No ↓

Gearbox breather vent leaking?
- Yes → R-11 B (Pg 2)
- No ↓

No. 5 labyrinth seal leaking?
- Yes → R-11 C (Pg 2)
- No → R-11 D (Pg 3)

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R-11. Oil Consumption High (Exceeding One Quart Per Five Hours Engine Operation)

R-11 A

• Examine diffuser vent orifice (Ref. TMI-2840-263-23, 72-00-00, 1.B.), Diffuser Vent Orifice Selection to verify orifice properly seated and not blocking feed port to no. 5 labyrinth seal. If it is blocking feed port, reseat properly so as not to block.
• Check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, 72-00-00, 1.B., Diffuser Vent Orifice Selection.

↓

Make check run to verify diffuser vent oil leakage eliminated.

↓

Return to service

R-11 B

• Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
• Remove compressor module IAW TMI-2840-263-23, 72-30-00, para 1.A. (This also requires removal of turbine module IAW TMI-2840-263-23, 72-50-00, para 1.A.)
• Remove and replace **Breather gearshaft lip seal** per TMI-2840-263-23, 72-60-00, para 1.B.
• Reinstall compressor and turbine modules per TMI-2840-263-23, 72-30-00, para 1.B. and 72-50-00, 1.B.
• Reinstall engine IAW TM 55-1520-248-23, Task 4-1-2.*

↓

Return to service

R-11 C

• Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
• Remove and replace **Turbine module** IAW TMI-2840-263-23, 72-50-00, para 1.A. and 1.B.
• Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).
• As a part of the check runs accompanying engine installation Task 4-1-2, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, 72-00-00, 1.B., Diffuser Vent Orifice Selection.

↓

Return to service

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R-11. Oil Consumption High (Exceeding One Quart Per Five Hours Engine Operation)

R-11
D

- Remove air induction cowl IAW (Similar to TM 55-1520-248-23, Task 4-2-1).
- Inspect inlet of compressor for oil wetting on impeller.
- Inspect forward end of impeller for radial looseness.

Oil wetting or impeller looseness noted?

No

Yes

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove and replace **Compressor module** IAW TMI-2840-263-23, 72-30-00, para 1.A. and 1.B. (This also requires removal and reinstallation of turbine module IAW TMI-2840-263-23,72-50-00, para 1.A. and 1.B.)
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).
- As a part of the check runs accompanying engine installation Task 4-1-2, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-263-23, 72-00-00, 1.B., Diffuser Vent Orifice Selection.

Return to service

Service power turbine support oil supply and scavenge details IAW following tasks of TMI-2840-263-23,72-50-00, para 5.F.
- Remove power turbine pressure oil fitting, screen, and nozzle.
- Service power turbine pressure oil fitting, screen, and nozzle.
- Install power turbine pressure oil fitting, screen, and nozzle.
- Service power turbine scavenge oil strut.
- Remove and service scavenge oil sump.
- Measure oil flow from power turbine scavenge oil strut.
- Install scavenge oil sump.
- Measure engine oil system scavenge oil flow.

Scav oil flow measurement test OK?

No

Yes

Perform check run to verify satisfactory oil consumption.

Is oil consumption satisfactory?

No

Yes

Return to service

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove and replace **Accessory gearbox module** IAW TMI-2840-263-23, 72-60-00, para 1.A., respectively (this requires removal and reinstallation of compressor and turbine modules).
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

Return to service

- Remove engine IAW (Similar TM 55-1520-248-23, Task 4-1-1).
- Remove and replace **Turbine module** IAW TMI-2840-263-23, 72-50-00, para 1.A. and 1.B.
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).
- As a part of the check runs accompanying engine installation Task 4-1-2, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, 72-00-00, 1.B., Diffuser Vent Orifice Selection.

Return to service

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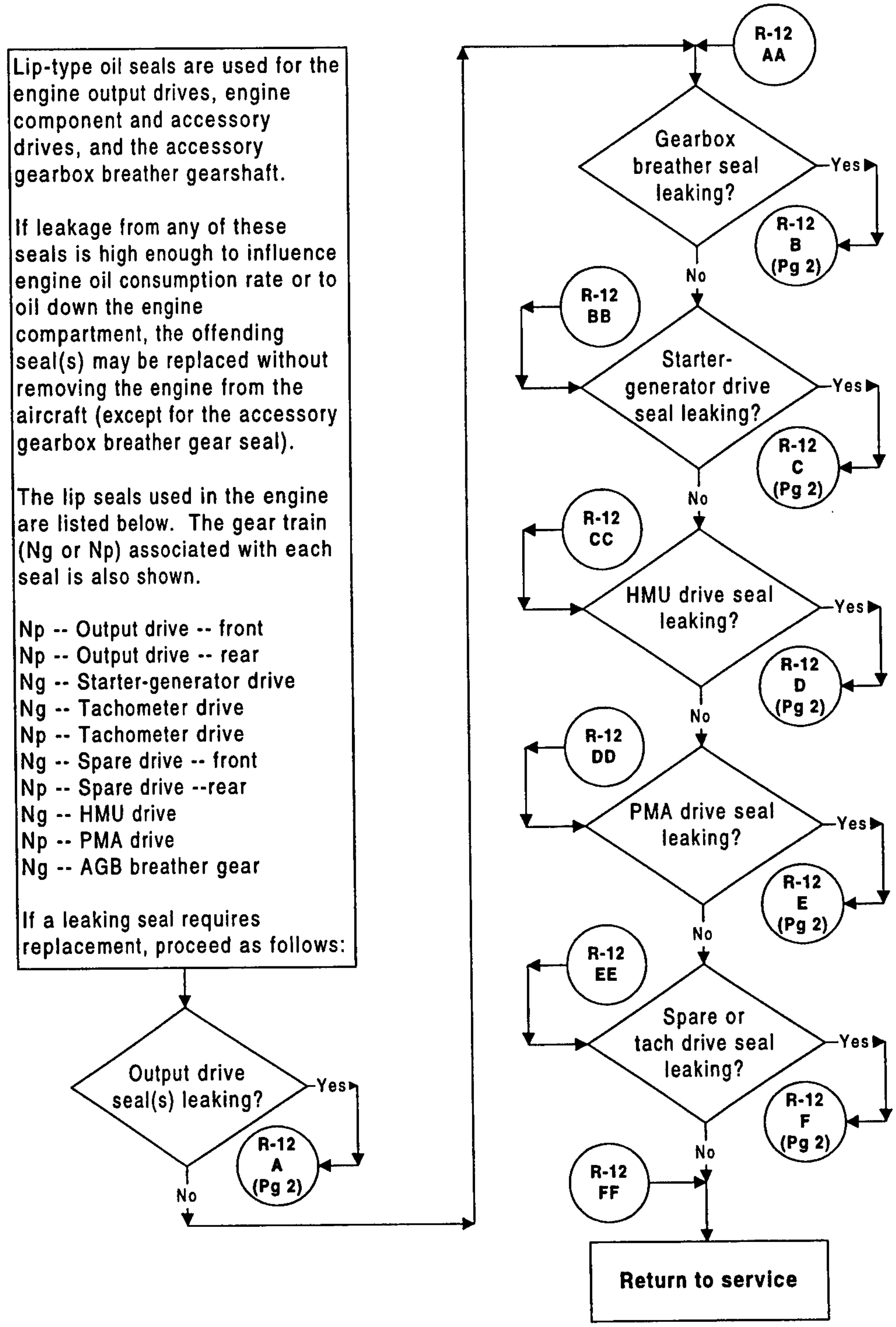
R-12. Oil Leaking From Accessory Gearbox Drive(s)



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R-12. Oil Leaking From Accessory Gearbox Drive(s)

R-12 A

Leakage of these seals is usually detected by an increase in aircraft transmission oil level, as visual indications of leakage are obscured by the presence of the freewheeling unit.

Remove and replace leaking output drive seal(s) IAW (Similar to TM 55-1520-248-23, Task 4-1-9). This requires execution of the following tasks as well:

- Forward fairing removal/installation (2-1-21)
- Air induction cowl removal/installation (4-2-1, 4-2-3)
- Engine-to transmission driveshaft removal/ installation (6-2-2)
- Forward tail rotor assembly shaft removal/ installation (6-6-1)
- Freewheeling unit removal/installation (6-5-1, 6-5-7)
- Freewheeling unit forward housing assembly removal/ installation (6-5-1, 6-5-7)
- Freewheeling unit aft bearing and seal cap removal/installation (6-5-1, 6-5-7)
- AC generator assembly removal/installation (9-4-8, 9-4-9)

After seal installation, perform check run to verify leakage corrected.

→ R-12 AA (Pg 1)

R-12 B

- Remove engine IAW TM (Similar to 55-1520-248-23, Task 4-1-1).
- Remove compressor module IAW TMI-2840-263-23, 72-30-00, para 1.A. (This also requires removal of turbine module IAW TMI-2840-263-23, 72-50-00,para 1.A.)
- Remove and replace **Breather gearshaft lip seal** perTMI-2840-263-23, 72-60-00, para 1.B.
- Reinstall compressor and turbine modules per TMI-2840-263-23, 72-30-00, para 1.B., and 72-50-00, para 1.B.
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

→ R-12 BB (Pg 1)

R-12 C

- Remove starter-generator IAW (Similar to TM 55-1520-248-23, Task 9-3-15).
- Remove and replace **Starter-generator drive lip seal** IAW TMI-2840-263-23, 72-60-00, para 1.B.
- Reinstall starter-generator IAW (Similar to TM 55-1520-248-23, Task 9-3-15) using a new O-ring on the drive shaft at the base of the spline.

After seal installation, perform check run to verify leakage corrected.

→ R-12 CC (Pg 1)

R-12 D

- Remove HMU IAW TMI-2840-263-23, 73-21-01, para 1.A.
- Remove and replace **HMU drive lip seal** IAW TMI-2840-263-23, 72-60-00, para 1.B.
- Reinstall HMU per TMI-2840-263-23, 73-21-01, para 1.B. using new O-ring on drive shaft at base of spline. Task includes rigging check (Para 1.D.), fuel system purge (Para 1.B.), and maintenance check flight.

Prior to flight check, perform ground check run to verify seal leakage corrected.

→ R-12 DD (Pg 1)

R-12 E

- Remove PMA IAW TMI-2840-263-23, 73-20-01, para 1.B.
- Remove and replace **PMA drive lip seal** per TMI-2840-263-23, 72-60-00, para 1.B.
- Reinstall PMA per TMI-2840-263-23, 73-20-01, para 2.B.

After seal installation, perform check run to verify leakage corrected.

→ R-12 EE (Pg 1)

R-12 F

- Remove unspecified accessory mounted on leaking drive IAW applicable task of (Similar to TM 55-1540-248-33).
- Remove and replace **Tach or spare drive lip seal** IAW TMI-2840-263-23, 72-60-00, para 1.B.
- Reinstall unspecified accessory IAW applicable task of (Similar to TM 55-1540-248-33).

→ R-12 FF (Pg 1)

8 Oct 1997
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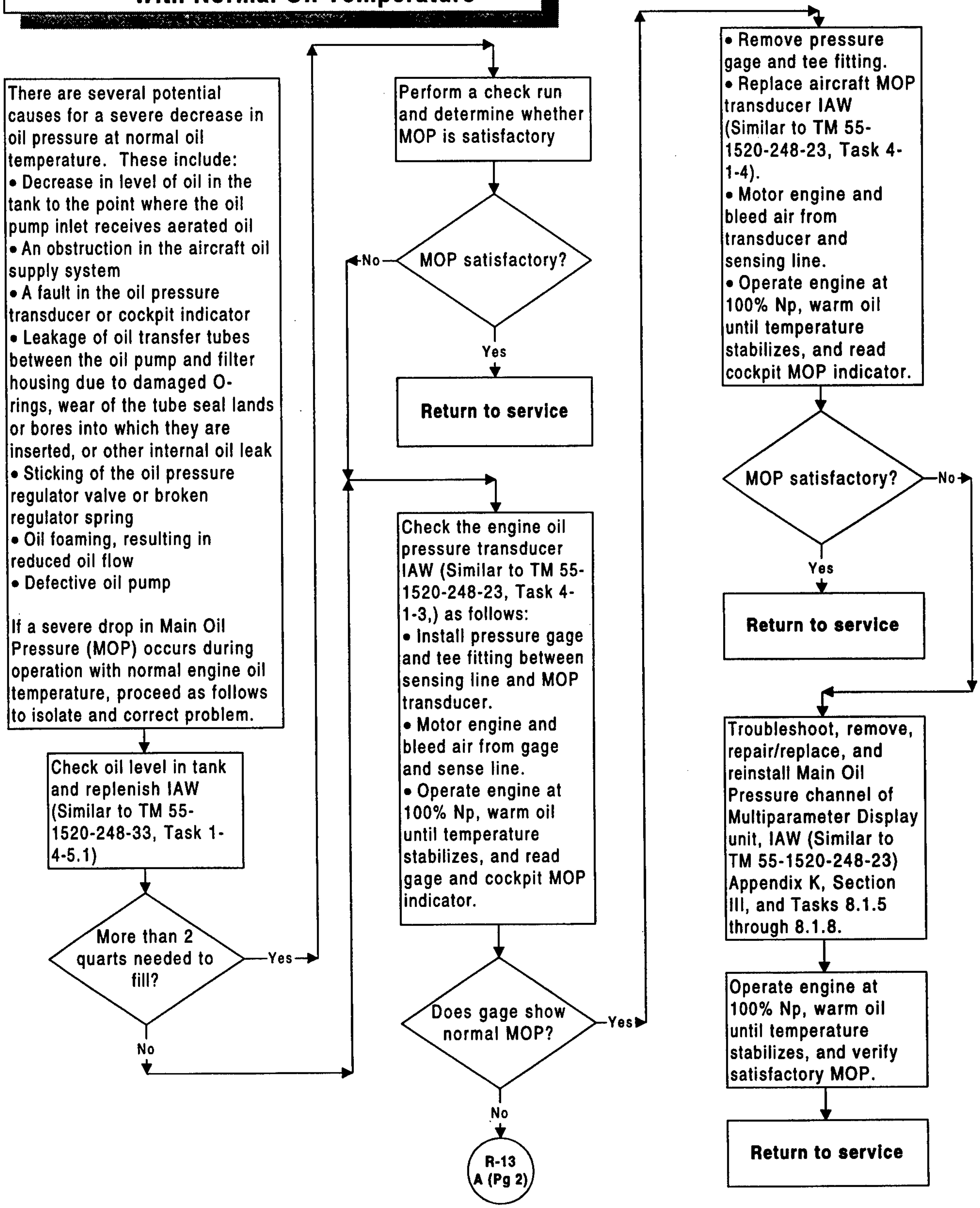
R-13. Oil Pressure Drops Off Severely With Normal Oil Temperature



9 Oct 1997
Rev. A 17 Feb 1998

R-13. Oil Pressure Drops Off Severely With Normal Oil Temperature

R-13 A

Remove and inspect oil pressure regulator valve assembly IAW TMI-2840-263-23, 72-60-00, para 2.D. and 3.A. Repair as needed and reinstall per TMI-2840-263-23, 72-60-00, para 1.D.

Operate engine at 100% Np, warm oil until temperature stabilizes, and verify MOP does not drop off significantly as oil warms.

MOP drop significantly as oil warms?

- No:

Adjust oil pressure regulating valve IAW TMI-2840-263-23, 72-60-00, para 3.A.

Return to service

- Yes:

• Remove oil filter housing and check valve IAW TMI-2840-263-23,72-60-00, para 1.D.
• Remove transfer tubes and inspect O-rings on both ends, as well as check valve O-rings.
• Inspect O-ring lands on transfer tubes and check valve for wear.
• Inspect bores in filter housing body and accessory gearbox housing (where transfer tubes and check valve are inserted) for wear.

• If O-ring land wear is noted on oil transfer tubes, replace
Oil transfer tubes
• If O-ring land wear is noted on oil check valve, replace
Oil check valve
• If transfer tube bore wear is noted in oil filter housing, replace
Oil filter housing

Transfer tube bore wear in gearbox housing?

- Yes: R-13 BB (Pg 3)

- No:

Reinstall oil filter housing, transfer tubes, and check valve per Para 1.D., using all new O-rings and gasket.

Operate engine at 100% Np, warm oil until temperature stabilizes, and verify MOP satisfactory.

MOP satisfactory?

- Yes: **Return to service**

- No:

Service engine oil system IAW TMI-2840-263-23, 72-00-00, para 8.A., Lubrication System Servicing. This includes the following:
• Drain oil tank (Similar to TM 55-1520-248-23,Task 1-4-5).
• Inspect oil tank for carbon, sludge, and deposits (Similar to TM 55-1520-248-23, Task 4-4-2).
• Remove, inspect, service, reinstall engine oil filter element (TMI-2840-263-23, 72-60-00, para 1.C.).
• Clean oil filter housing assembly (TMI-2840-263-23, 72-60-00, para 1.C.).
• Remove, inspect, service, and reinstall side and bottom chip detectors (TMI-2840-263-23, 72-60-00, para 4.B.).
• If contaminants noted in oil, remove, clean, and reinstall oil pressure reducer TMI-2840-263-23, 72-00-00, para 8.A., Lubrication System Servicing, and flush aircraft oil lines and oil cooler.

R-13 AA (Pg 3)

9 Oct 1997
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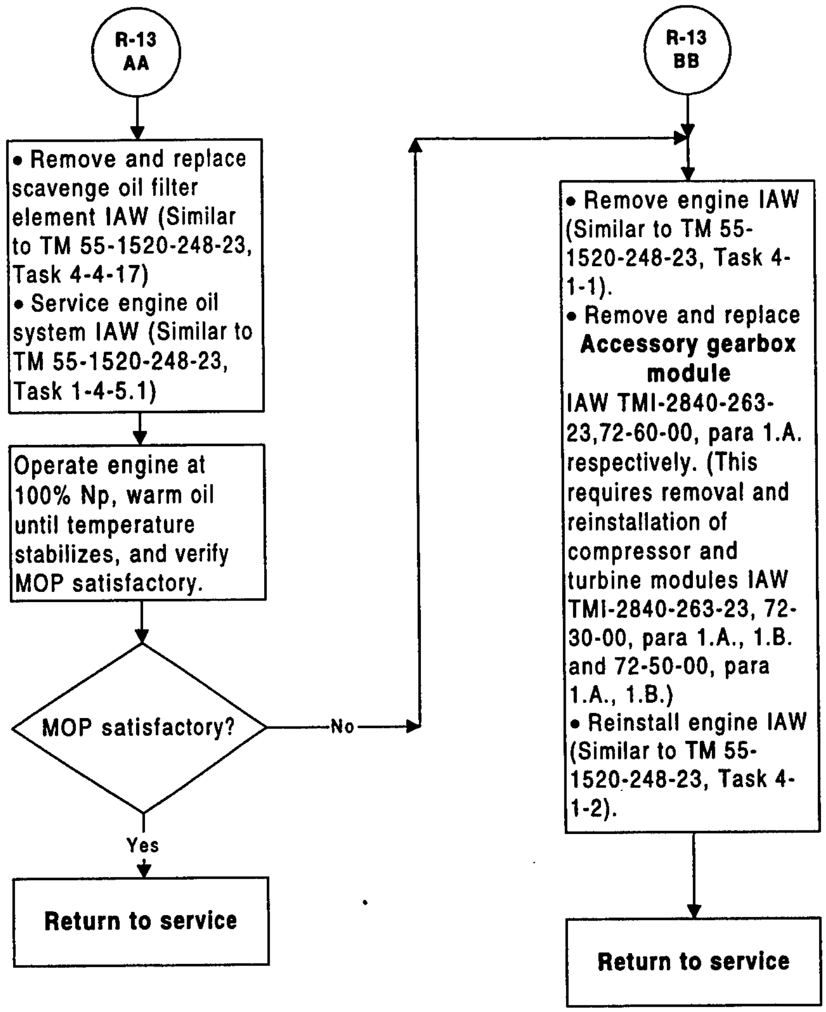
R-13. Oil Pressure Drops Off Severely With Normal Oil Temperature



9 Oct 1997
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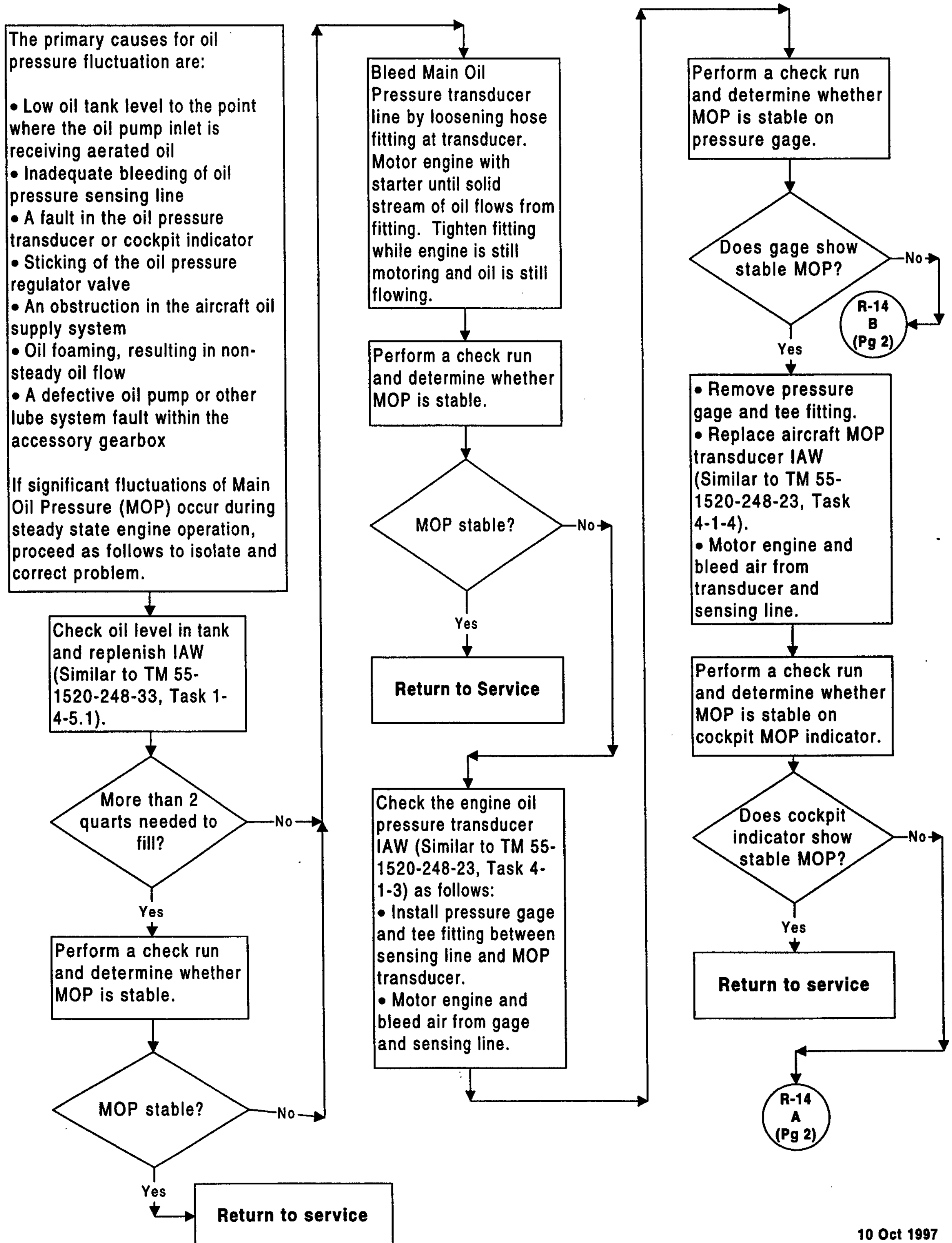
R-14. Oil Pressure Fluctuates



10 Oct 1997
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R-14. Oil Pressure Fluctuates

R-14 A

Troubleshoot, remove, repair/replace, and reinstall Main Oil Pressure channel of Multiparameter Display unit, IAW (Similar to TM 55-1520-248-23, Appendix K, Section III, and Tasks 8.1.5 through 8.1.8).

Perform a check run and verify stable MOP on cockpit indicator.

Return to service

R-14 B

Remove and inspect oil pressure regulator valve assembly IAW TMI-2840-263-23, 72-60-00, para 2.D. and 3.A.
Repair as needed and reinstall per TMI-2840-263-23, 72-60-00, para 2.F.

Perform a check run and determine whether MOP is stable.

MOP stable?

No

Yes

Adjust oil pressure regulating valve IAW TMI-2840-263-23, 72-60-00, para 3.A.

Return to service

Service engine oil system IAW TMI-2840-263-23, 72-00-00, para 8.A., Lubrication System Servicing. This includes the following:
- Drain oil tank (Similar to TM 55-1520-248-23,Task 1-4-5).
- Inspect oil tank for carbon, sludge, and deposits (Similar to TM 55-1520-248-23, Task 4-4-2).
- Remove, inspect, service, reinstall engine oil filter element (TMI-2840-263-23, 72-60-00, para 1.C.).
- Clean oil filter housing assembly (TMI-2840-263-23, 72-60-00, para 1.C.).
- Remove, inspect, service, and reinstall side and bottom chip detectors (TMI-2840-263-23,72-60-00, para 4.B.).
- If contaminants noted in oil, remove, clean, and reinstall oil pressure reducer TMI-2840-263-2372-00-00, para 8.A., Lubrication System Servicing), and flush aircraft oil lines and oil cooler.

- Remove and replace scavenge oil filter element IAW (Similar to TM 55-1520-248-23, Task 4-4-17).
- Service engine oil system IAW (Similar to TM 55-1520-248-23, Task 1-4-5.1).

Perform a check run and determine whether MOP is stable.

MOP stable?

No

R-14 AA (Pg 3)

Yes

Return to service

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R-14. Oil Pressure Fluctuates

R-14
A

• Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
• Remove and replace **Accessory gearbox module** IAW TMI-2840-263-23,72-60-00, para 1.A., respectively. (This requires removal and reinstallation of compressor and turbine modules IAW TMI-2840-263-23, 72-30-00, para 1.A,1.B., and 72-50-00, para 1.A, 1.B.)
• Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

Return to service

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R-15. Oil Pressure Too High

Main Oil Pressure (MOP) above 130 PSIG, when encountered with a newly installed engine or after parts changes that affect oil flow or MOP regulation, can be handled with an adjustment of the oil pressure regulator. A sudden increase for no obvious reason, however, is cause to suspect other oil system problems, whose diagnosis and correction should not be masked by an oil pressure regulator adjustment.

The most likely causes of high MOP are:

- Measurement error by aircraft MOP transducer or cockpit indicator
- Obstruction of pressure oil passage(s) within the accessory gearbox
- Blockage of oil supply to the turbine module or to one or both turbine oil nozzles

Only the first item can be corrected without engine removal for teardown, inspection, and repair.

If Main Oil Pressure above 130 PSIG is encountered (except immediately after an engine start during cold weather operations), proceed as follows to resolve.

Check the engine oil pressure transducer IAW (Similar to TM 55-1520-248-23, Task 4-1-3, as follows:)

- Install pressure gage and tee fitting between sensing line and MOP transducer.
- Motor engine and bleed air from gage and sensing line.

- Start the engine, and while maintaining allowable oil pressure limits as indicated by the gage, warm the oil to normal operating temperature.
- Increase power to light-on skids condition but not above 130 PSIG.
- Read pressure on gage and on cockpit indicator.

Does gage confirm high MOP?

No:

- Remove pressure gage and tee fitting.
- Replace aircraft MOP transducer IAW (Similar to TM 55-1520-248-23, Task 4-1-4).
- Motor engine and bleed air from transducer and sensing line.

Perform a check run and determine whether high MOP is still shown by cockpit indicator.

MOP satisfactory on cockpit indicator?

Yes: **Return to service**

No: Troubleshoot, remove, repair/replace, and reinstall Main Oil Pressure channel of Multiparameter Display unit, IAW (Similar to TM 55-1520-248-23, Appendix K, Section III, and Tasks 8-1-5 through 8-1-8).

Perform a check run and verify satisfactory MOP on cockpit indicator.

Return to service

Does gage confirm high MOP? Yes:

Is this a newly installed engine?

No: Were parts changes affecting MOP just made?

No: R-15 A (Pg 2)

Yes (either question): Adjust oil pressure regulating valve IAW TMI-2840-263-23,72-60-00, para 3.A.

Yes: **Return to service**

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R-15. Oil Pressure Too High

R-15
A

• Remove and
Replace engine
IAW (Similar to TM 55-1520-248-23, Tasks 4-1-1 and 4-1-2).
• Service engine oil system IAW TMI-2840-263-23, 72-00-00,para 8.A., Lubrication System Servicing and (Similar to TM 55-1520-248-23, Task1-4-5.1).
• Remove and replace scavenge oil filter element IAW (Similar to TM 55-1520-248-23, Task 4-4-17).
• Flush aircraft oil lines and oil cooler.

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R-16. Oil Pressure Too Low

Low Main Oil Pressure (below 115 PSIG), when encountered with a newly installed engine or after parts changes that affect oil flow or MOP regulation, can be handled with an adjustment of the oil pressure regulator. A sudden or progressive decrease for no obvious reason, however, is cause to suspect other oil system problems, whose diagnosis and correction should not be masked by an oil pressure regulator adjustment.

The most likely causes of low MOP are:

- Decrease in level of oil in the tank to the point where the oil pump inlet is receiving aerated oil
- External oil leak
- Obstruction in the aircraft oil supply system
- Clogged oil filter
- A fault in the aircraft oil pressure transducer or cockpit indicator
- Sticking oil pressure regulator valve or broken regulator spring
- Leakage of oil transfer tubes between the oil pump and filter housing due to cut O-ring, wear of the tube seal lands or bores into which they engage, or other internal oil leak
- Excessive oil temperature resulting from aircraft oil cooler (or related) fault
- Oil foaming, resulting in reduced oil flow
- A defective oil pump

If Main Oil Pressure is not at least 50 PSIG from Ground Idle to 79% Ng, 90 PSIG from 79% to 94% Ng and 115 PSIG at speeds above 94% Ng, perform the following sequence to isolate and resolve the problem:

Visually inspect the engine, lube system, and drains for external leakage.

External oil leakage or drainage noted? — No / Yes

Yes:

Locate source(s) of leakage and correct as follows:
- **TUBE ENDS, HOSE ENDS, FITTINGS, ETC.** -- tighten, repair, or replace as required
- **EXTERNAL LUBE SYSTEM COMPONENTS** -- repair or replace IAW (Similar to TM 55-1520-248-23: **Oil tank** -- Tasks 4-4-1 through 4-4-8 **Oil cooler bypass valve** -- Task 4-4-9 **Oil scavenge filter** -- Task 4-4-18)

- Check oil level in tank and replenish IAW (Similar to TM 55-1520-248-33, Task 1-4-5.1).
- Perform check run to verify satisfactory MOP (very brief if MOP below limits).

MOP satisfactory? — Yes / No

Yes: **Return to service**

No: R-16 A (Pg 1)

No (external leakage):

Check oil level in tank and replenish IAW (Similar to TM 55-1520-248-33, Task 1-4-5.1).

More than 2 quarts needed to fill? — Yes / No

Yes:

Perform check run to verify satisfactory MOP (very brief if MOP below limits).

MOP satisfactory? — Yes / No

Yes: **Return to service**

No: R-16 A

R-16 A

Check the engine oil pressure transducer IAW (Similar to TM 55-1520-248-23, Task 4-1-3), as follows:
- Install pressure gage and tee fitting between sensing line and MOP transducer.
- Motor engine and bleed air from gage and sensing line.
- Operate engine at 100% Np and read gage and cockpit MOP indicator. If MOP is within limits on gage, continue to operate until oil temperature stabilizes and recheck gage and cockpit indicator).

R-16 B (Pg 2)

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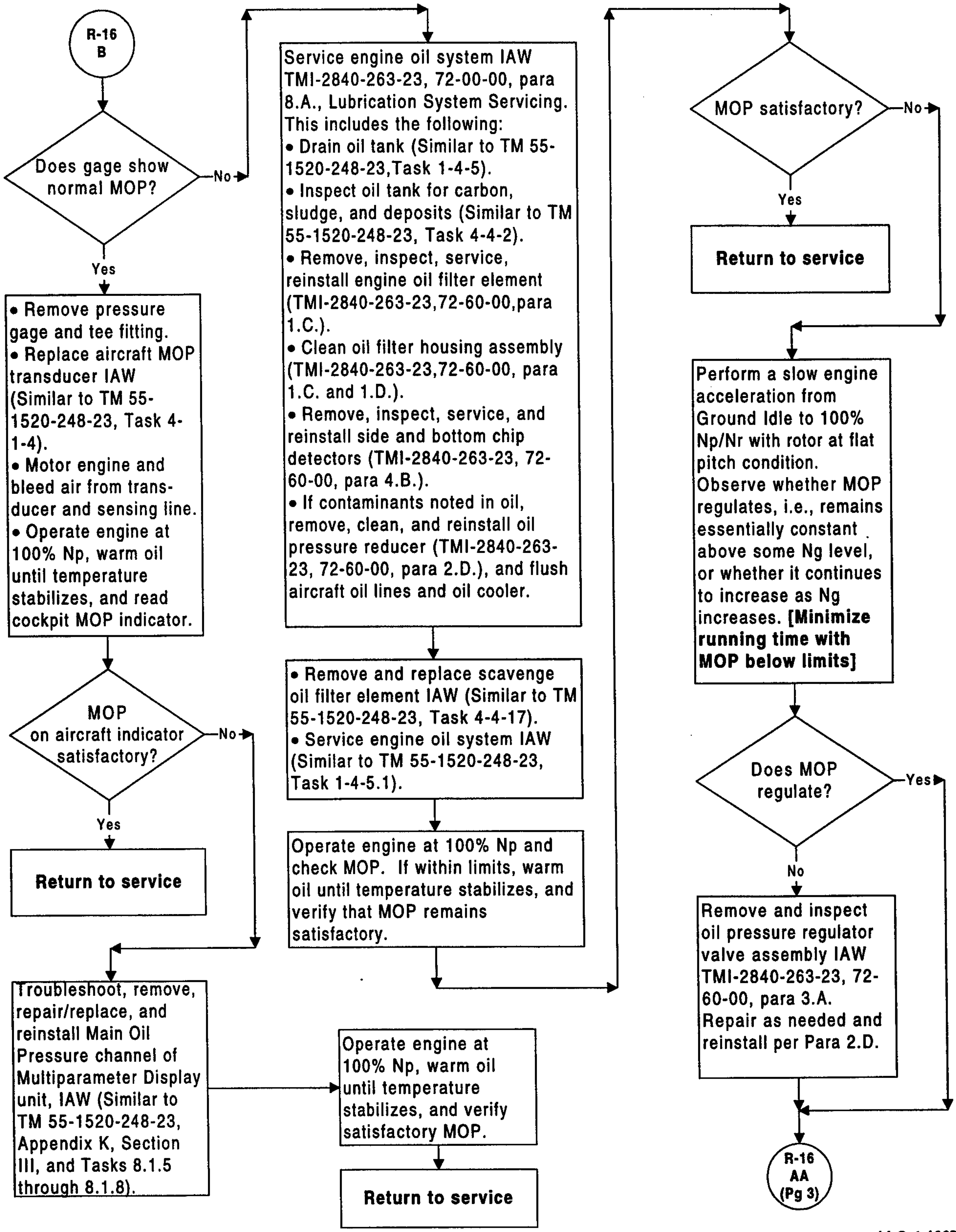
R-16. Oil Pressure Too Low



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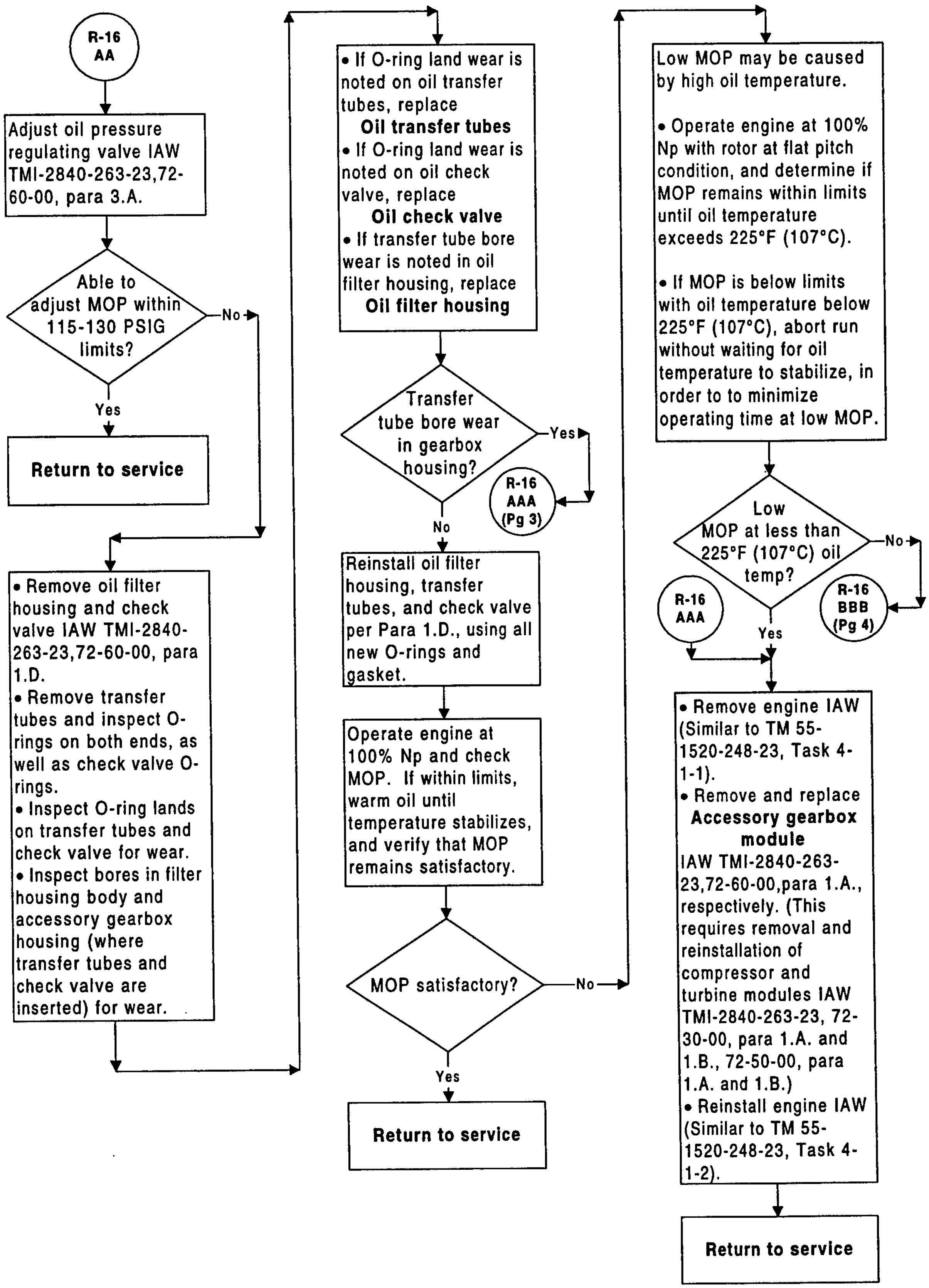
R-16. Oil Pressure Too Low



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R-16. Oil Pressure Too Low

R-16
BBB

• Check oil cooler blower inlet for obstructions and clear as needed.
• Check oil cooler outlet duct for obstructions and clear as needed.

If no obstructions found, check oil cooler bypass valve:
• Perform oil cooler bypass valve functional check IAW (Similar to TM 55-1520-248-23, Task 4-4-8.1). If required, remove, inspect, repair, and reinstall bypass valve per (Tasks 4-4-9 and 4-4-10).

If oil cooler valve bypass valve is satisfactory, check oil cooler temperature control valve:
• Remove, clean, inspect, repair/ replace, and reinstall oil temperature control valve IAW (Similar to TM 55-1520-248-23, Tasks 6-8-20 and 6-8-21).

If oil cooler temperature control valve is satisfactory, check oil cooler:
• Remove, clean, inspect, repair/ replace, build up, and reinstall oil cooler IAW (Similar toTM 55-1520-248-23, Tasks 6-8-22 through 6-8-24).

↓

Service engine oil system IAW (Similar to TM 55-1520-248-23, Task 1-4-5.1 and transmission oil system per Task 1-4-6.1).

↓

Operate engine at 100% Np and warm oil until temperature stabilizes. Verify that oil temperature regulates properly and MOP remains satisfactory.

↓

Return to service

14 Oct 1997
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R-17. Engine Oil Tank Fills During Flight As Aircraft Transmission Oil Level Decreases

Transfer of oil from the aircraft transmission lube system to the engine lube system can occur:
• At the interface between the engine accessory gearbox front output drive and the aircraft free-wheeling unit (FWU)
and/or
• At the rear accessory gearbox power takeoff, where the aircraft tail rotor drive shaft aft bearing and seal cap is mounted.

The FWU lube circuits are isolated from the engine lube system by lip seals at the engine front and rear output drives, but lip seal leakage or inadequate scavenging of the FWU can allow entry of aircraft oil into the engine lube system.

If the level of oil in the engine tank is observed to be increasing with time during operation while the transmission oil level is decreasing, proceed as follows:

↓

Inspect oil return line from FWU to transmission for sharp bends, kinks, or obstructions that could inhibit proper scavenging of oil from the FWU, and correct as required.

↓

Oil flow obstructions located and corrected?

No →

• Remove AC generator from left rear side of engine (Task 9-4-8) for required clearance.
• Remove FWU IAW (Similar to TM 55-1520-248-23, Task 6-5-1). This requires removal of engine-to-transmission drive shaft (Task 6-2-2) and removal of forward tail rotor shaft (Task 6-6-1).
• Remove and replace **Front and rear accessory gearbox output drive lip seals** IAW TMI-2840-263-23, 72-60-00, para 1.B.
• Reinstall AC generator IAW (Similar to TM 55-1520-248-23, Task 9-4-9)
• Reinstall FWU per Task 6-5-7, which includes installation of engine-to-transmission drive shaft (Task 6-2-2) and installation of forward tail rotor shaft (Task 6-6-1)

Yes →

Service engine oil system IAW TMI-2840-263-23, 72-60-00, para 8.A., Lubrication System Servicing. This includes the following:
• Drain oil tank (Similar to TM 55-1520-248-23,Task 1-4-5).
• Inspect oil tank for carbon, sludge, and deposits (Similar to TM 55-1520-248-23, Task 4-4-2).
• Remove, inspect, service, reinstall engine oil filter element (TMI-2840-263-23, 72-60-00, para 1.C.).
• Clean oil filter housing assembly TMI-2840-263-23,72-60-00, para 1.D. and 2.F.
• Remove, inspect, service, and reinstall side and bottom chip detectors (TMI-2840-263-23, 72-60-00, para 4.B.).
• Flush engine-related aircraft oil lines and oil cooler.
• If contaminants noted in oil, remove, clean, and reinstall oil pressure reducer TMI-2840-263-23, 72-00-00, para 8.A., Lubrication System Servicing.

↓

• Remove and replace scavenge oil filter element IAW (Similar to TM 55-1520-248-23, Task 4-4-17).
• Service engine oil system IAW (Similar to TM 55-1520-248-23, Task 1-4-5.1).

↓

Ground run engine at 100% Np for at least one hour to verify no transfer of oil between aircraft and engine lube systems.

↓

Return to service

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R-18. Aircraft Transmission Oil Level Increases During Flight As Engine Oil Tank Empties

Transfer of oil from the engine lube system to the aircraft transmission lube system can occur:

- At the interface between the engine accessory gearbox front output drive and the aircraft free-wheeling unit (FWU)

and/or

- At the rear accessory gearbox power takeoff, where the aircraft tail rotor drive shaft aft bearing and seal cap is mounted

The FWU lube circuits are isolated from the engine lube system by lip seals at the engine front and rear output drives, but lip seal leakage can allow entry of engine oil into the aircraft lube system, particularly when driven by an abnormally high accessory gearbox breather pressure.

If the level of oil in the transmission is observed to be increasing with time during operation while the engine oil tank level is decreasing, proceed as follows:

Inspect the accessory gearbox breather exit port, on the right forward side of the exhaust collector, for excessive oil wetness or puddling. This is indicative of high accessory gearbox internal breather pressure (or of a leaking breather gearshaft lip seal).

Excessive oil wetness around breather exit port?

- No → R-18 B (Pg 3)
- Yes ↓

Oil loss through the accessory gearbox breather vent can be caused by:

- Excessive compressor seal vent pressure
- Breather gearshaft lip seal leakage
- Excessive internal pressure resulting from worn or damaged turbine labyrinth seals

- Examine diffuser vent orifice TMI-2840-263-23, 72-00-00, para 1.B., Diffuser Vent Orifice Selection, to verify orifice properly seated and not blocking feed port to No. 5 labyrinth seal. If it is blocking feed port, reseat properly so as not to block.
- Check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, 72-00-00, para 1.B., Diffuser Vent Orifice Selection.

Was it necessary to install larger orifice?

- No → R-18 A (Pg 2)
- Yes ↓

Make a check run at 100% Np and determine whether wetness still exists around gearbox breather exit port.

Breather exit port still wet with oil?

- Yes → R-18 A (Pg 2)
- No ↓

Ground run engine at 100% Np for at least one hour to verify no transfer of oil between aircraft and engine lube systems.

Any oil transfer from engine to transmission?

- Yes → R-18 B (Pg 3)
- No ↓

- Drain transmission oil IAW (Similar to TM 55-1520-248-23, Task 1-4-6).
- Drain FWU per Task 1-4-6.
- Remove/clean/replace transmission filters per Tasks 1-4-6, 1-4-6.1, 6-8-3.
- Refill and service transmission per Task 1-4-6.1.

Ground run engine at 100% Np for at least one hour to verify no transfer of oil between aircraft and engine lube systems.

Return to service

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R-18. Aircraft Transmission Oil Level Increases During Flight As Engine Oil Tank Empties

R-18
A

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove FWU IAW (TM 55-1520-248-23, Task 6-5-1).
- Remove compressor module IAW TMI-2840-263-3, 72-30-00, para 1.A. (This also requires removal of turbine module IAW TMI-2840-263-23, 72-50-00, para 1.A.)
- Remove and replace **Breather gearshaft lip seal** and **Front and rear accessory gearbox output drive lip seals** IAW TMI-2840-263-23, 72-60-00,para 1.B.
- Reinstall compressor and turbine modules IAW TMI-2840-263-23, 72-30-00, para 1.B. and 72-50-00, para 1.B.
- Reinstall FWU IAW (Similar to TM 55-1520-248-23, Task 6-5-7)
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

Ground run engine at 100% Np for at least one hour to verify no transfer of oil between aircraft and engine lube systems.

Any oil transfer from engine to transmission?

No

- Drain transmission oil IAW (Similar to TM 55-1520-248-23, Task 1-4-6).
- Drain FWU per Task 1-4-6.
- Remove/clean/replace transmission filters per Tasks 1-4-6, 1-4-6.1, 6-8-3.
- Refill and service transmission per Task 1-4-6.1.

Return to service

Yes

Excessive oil wetness around breather exit port?

Yes

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove and replace **Turbine module** IAW TMI-2840-263-23, 72-50-00, para 1.A. adn 1.B.
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).
- As a part of the check runs accompanying engine installation Task 4-1-2, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, 72-00-00, para 1.B., Diffuser Vent Orifice Selection.

No

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1.)
- Remove and replace **Accessory gearbox module** IAW TMI-2840-263-23, 72-60-00, para 1.A. respectively (this requires removal and reinstallation of compressor and turbine modules IAW 72-30-00, para 1.A., 1.B. and 72-50-00, para 1.A.,1.B.)
- Reinstall engine IAW TM 55-1520-248-23, Task 4-1-2*

Ground run engine at 100% Np for at least one hour to verify no transfer of oil between aircraft and engine lube systems.

- Drain transmission oil IAW (Similar to TM 55-1520-248-23, Task 1-4-6).
- Drain FWU per Task 1-4-6
- Remove/clean/replace transmission filters per Tasks 1-4-6, 1-4-6.1, 6-8-3.
- Refill and service transmission per Task 1-4-6.1.

Return to service

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R-18. Aircraft Transmission Oil Level Increases During Flight As Engine Oil Tank Empties

R-18 B

- Remove FWU IAW (Similar to TM 55-1520-248-23, Task 6-5-1). This requires removal of engine-to-transmission drive shaft (Task 6-2-2) and removal of forward tail rotor shaft (Task 6-6-1)
- Remove AC generator from left rear side of engine (Task 9-4-8) for required clearance.
- Remove and replace **Front and rear accessory gearbox output drive lip seals** IAW TMI-2840-263-23, 72-60-00, para 1.B.
- Reinstall AC generator IAW (Similar to TM 55-1520-248-23, Task 9-4-9).
- Reinstall FWU per Task 6-5-7, which includes installation of engine-to-transmission drive shaft (Task 6-2-2) and installation of forward tail rotor shaft (Task 6-6-1).

Ground run engine at 100% Np for at least one hour to verify no transfer of oil between aircraft and engine lube systems.

Any oil transfer from engine to transmission?

Yes

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove and replace **Accessory gearbox module** IAWTMI-2840-263-23, 72-60-00, para 1.A. respectively. (This requires removal and reinstallation of compressor and turbine modules IAW 72-30-00, para 1.A.,1.B. and 72-50-00, para 1.A., 1.B.)
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

Ground run engine at 100% Np for at least one hour to verify no transfer of oil between aircraft and engine lube systems.

No

- Drain transmission oil IAW (Similar to TM 55-1520-248-23, Task 1-4-6).
- Drain FWU per Task 1-4-6.
- Remove/clean/replace transmission filters per Tasks 1-4-6, 1-4-6.1, 6-8-3.
- Refill and service transmission per Task 1-4-6.1.

Return to service

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R-19. Oil Spewing Or Seeping From Compressor Vent Orifice And Tubing Joints

The compressor diffuser vent system, which provides buffering pressure to the compressor impeller rear inner labyrinth seal and the turbine No. 5 labyrinth seal, consists of a 2-piece tube, flanged on both ends with slip joint between, and gaskets at the flanges. At the forward end, the tube connects to a mating flange on the compressor diffuser, and, at the aft end, to another flange on the turbine exhaust collector. A size-selected orifice, which controls vent system pressure, is located at the exhaust collector end.

If the vent pressure is too low, oil can leak past either or both of the labyrinth seals, the compressor seal into the vent tube and thence into the exhaust collector, and the No. 5 seal into the exhaust collector hub fairing. If the pressure is too high, it increases internal breather pressure in the accessory gearbox, which raises oil consumption by increasing oil blown overboard through the AGB breather vent.

If oil spewing or seeping from the diffuser vent orifice or tubing joints is encountered, the vent pressure must be adjusted by orifice resizing.

Proceed as follows:

- Remove vent tube (both sections), IAW TMI-2840-263-23, 72-00-00, para 1.B., Diffuser Vent Orifice Selection.
- Examine diffuser vent orifice to verify orifice properly seated and not blocking feed port to No. 5 labyrinth seal. If it is blocking feed port, reseat properly so as not to block.
- Check flatness of vent tube flange faces. Replace either or both if bent or distorted.
- Reassemble with new gaskets.

- Check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Ground run the engine and verify pressure is at least 0.8 in. Hg at Ground Idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, 72-00-00, para 1.B., Diffuser Vent Orifice Selection.

Return to service

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R-20. Oil Spewing Or Seeping From Gearbox Vent And Tubing Joints

The accessory gearbox overboard vent system is comprised of a breather gear that centrifugally separates oil droplets from air within the gearbox, before venting the air overboard through the gear hub. The vent air passes through an internal passage in the gearbox housing to an elbow fitting atop the gearbox. From there, it passes through a tube with an O-ring sealed slip joint to a flanged fitting on the front of the turbine exhaust collector (right side), where it passes overboard into the engine exhaust stream.

The only potential site for external seeping is the flange at the exhaust collector, which is sealed with a gasket. The slip joint has no leakage potential as long as the O-ring is intact.

Spewing into the exhaust stream can result from leakage of the lip seal on the centrifugal breather gearshaft, which bypasses the gear and does not benefit from the separating action. Another source is excessive air leakage into the gearbox, from too high compressor seal vent pressure or from worn or damaged turbine seals in cooling air or pressure balance circuits.

If oil spewing or seeping from the accessory gearbox breather vent or tubing joints is encountered, proceed as follows:

Spewing into exhaust collector from breather vent?
- Yes → Heavy or continuous exhaust smoke noted?
- No → Any external seepage from breather vent tube?

Heavy or continuous exhaust smoke noted?
- Yes → Check diffuser vent pressure
- No → Oil consumption rate within limits?

Oil consumption rate within limits?
- No → Check diffuser vent pressure
- Yes → Any external seepage from breather vent tube?

Any external seepage from breather vent tube?
- Yes → R-20 A (Pg 2)
- No → **Return to service**

• Check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Ground run the engine and verify pressure is at least 0.8 in. Hg at Ground Idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, 72-00-00, para 1.B., Diffuser Vent Orifice Selection.

Was larger orifice needed?
- No → R-20 B (Pg 2)
- Yes → Does it still spew from breather vent?

Does it still spew from breather vent?
- No → Any external seepage from breather vent tube?
- Yes → R-20 B (Pg 2)

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R-20. Oil Spewing Or Seeping From Gearbox Vent And Tubing Joints

R-20 A

Correct external seepage of vent tube as follows (Ref. Similar to TM 55-2840-256-23, Task 5-1-3, steps 23 through 27):

- If the slip joint is the site of the seepage, replace the O-ring.
- If the seepage is at the flange, check flange face flatness with a straight-edge. If bent or distorted, replace the flanged tube. Use a new gasket when reassembling.

Make a ground check run to verify seepage is corrected.

Return to service

R-20 B

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove compressor module IAW TMI-2840-263-23, 72-30-00, para 1.A. (This also requires removal of turbine module IAW TMI-2840-263-23, 72-50-00,para 1.A.)
- Remove and replace **Breather gearshaft lip seal** IAW TMI-2840-263-23, 72-60-00, para 1.B.
- Reinstall compressor and turbine modules IAW TMI-2840-263-23, 72-30-00, para 1.B. and 72-50-00, para 1.B.
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

During ground running following reinstallation of engine, determine whether spewing still occurs.

Does it still spew from breather vent? — Yes: go to the right-hand box below. No: continue.

Any external seepage from breather vent tube? — Yes: go to R-20 A box "Correct external seepage of vent tube". No:

Return to service

(From "Yes" above:)

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove and replace **Turbine module** IAW TMI-2840-263-23, 72-50-00, para 1.A and 1.B.
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).
- As part of the check runs accompanying engine installation Task 4-1-2, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, 72-00-00, pra 1.B., Diffuser Vent Orifice Selection.

Return to service

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R-21. Oil Temperature Exceeds 107°C (225°F)

Engine main oil temperature (MOT) -- the temperature of oil supplied to the engine from the oil tank -- is limited to 107°C (225°F) on a continuous basis. It may exceed that temperature, up to as high as 120°C (248°F) for not more than 10 minutes, if the engine is inspected afterward. If the oil temperature exceeds 120°C (248°F) for **any** period of time, however brief, the engine must be removed from the aircraft and sent to a maintenance/overhaul facility for inspection and repair.

Causes of high MOT indication are usually either:

- Erroneous MOT measurement, involving the cockpit indicator, the oil temperature transducer, or the interconnecting wiring

or

- Problems in the aircraft oil cooling system (cooler, cooler temperature control valve, cooler fan, or cooler bypass valve).

If indicated oil temperature exceeded 107°C (225°F), proceed as follows:

Check calibration of MOT measurement system as follows:

- Drain oil tank IAW (Similar to TM 55-1520-248-23, Task 1-4-5).
- Remove oil temperature transducer from oil tank per Task 4-4-6.
- With oil temperature transducer connected electrically and aircraft powered up per Task 9-3-10, place transducer in container of boiling water. Allow to stabilize at a gentle boil and read cockpit MOT indication on Multiparameter Display unit (MPD). Compare reading with temperature of boiling water at the prevailing barometric pressure.

MPD within 5°F (2.8°C) of boiling water temp?

Yes → R-21 B (Pg 2)

No ↓

Obtain another known good oil temperature transducer and repeat calibration check in boiling water.

MPD within 5°F (2.8°C) of boiling water temp?

Yes → R-21 A (Pg 2)

No ↓

Troubleshoot, remove, repair/replace, and reinstall Main Oil Temperature channel of Multiparameter Display unit or related aircraft wiring, IAW (Similar to TM 55-1520-248-23, Appendix K, Section III, and Tasks 8.1.5 through 8.1.8.).

During boiling water checks, was MPD reading too high?

No → R-21 B (Pg 2)

Yes ↓

High enough to disprove oil overtemperature?

No → R-21 B (Pg 2)

Yes ↓

MPD read about the same with both temp transducers?

No → Reinstall the second oil temperature transducer

Yes ↓

Reinstall the original oil temperature transducer in the oil tank IAW (Similar to TM 55-1520-248-23, Task 4-4-6. Service oil tank per 1-4-5.1).

Reinstall the second oil temperature transducer in the oil tank IAW (Similar to TM 55-1520-248-23, Task 4-4-6. Service oil tank per 1-4-5.1).

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R-21. Oil Temperature Exceeds 107°C (225°F)

R-21 A

Did original transducer read higher on MPD?

Yes / No

High enough to disprove oil overtemperature?

Yes / No

Reinstall the second oil temperature transducer in the oil tank IAW (Similar to TM 55-1520-248-23, Task 4-4-6. Service oil tank per 1-4-5.1.).

Return to service

R-21 B

Based on logic to this point, it is likely an oil overtemperature occurred, and appropriate action must be taken, as follows:

Correct oil cooling system problem per the following sequence:

- Check oil cooler blower inlet for obstructions and clear as needed.
- Check oil cooler outlet duct for obstructions and clear as needed.

If no obstructions found, check oil cooler bypass valve:

- Perform oil cooler bypass valve functional check IAW (Similar to TM 55-1520-248-23, Task 4-4-8.1). If required, remove, inspect, repair, and reinstall bypass valve per Tasks 4-4-9 and 4-4-10.

If oil cooler valve bypass valve is satisfactory, check oil cooler temperature control valve:

- Remove, clean, inspect, repair/ replace, and reinstall oil temperature control valve IAW (Similar to TM 55-1520-248-23, Tasks 6-8-20 and 6-8-21).

If oil cooler temperature control valve is satisfactory, check oil cooler:

- Remove, clean, inspect, repair/ replace, build up, and reinstall oil cooler IAW (Similar to TM 55-1520-248-23, Tasks 6-8-22 through 6-8-24).

The answers to the following questions, based on pilot observations, establish actions required with respect to the engine.

Did observed oil temperature exceed 120°C (248°F)?

Yes / No

Did oil temp exceed 107°C (225°F) for over 10 minutes?

Yes / No

R-21 BB (Pg 3)

Service engine oil system IAW TMI-2840-263-23, 72-00-00, para 8.A., Lubrication System Servicing. This includes the following:

- Drain oil tank (Similar to TM 55-1520-248-23,Task 1-4-5).
- Inspect oil tank for carbon, sludge, and deposits (Similar to TM 55-1520-248-23, Task 4-4-2).
- Remove, inspect, service, reinstall engine oil filter element (TMI-2840-263-23, 72-60-00, para 1.C.).
- Clean oil filter housing assembly (TMI-2840-263-23, 72-60-00, para 1.D.).
- Remove, inspect, service, and reinstall side and bottom chip detectors (TMI-2840-263-23, 72-60-00, para 4.B.).
- If contaminants noted in oil, remove, clean, and reinstall oil pressure reducer (TMI-2840-263-23, 72-60-00, para 4.B.).

R-21 AA (Pg 3)

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R-21. Oil Temperature Exceeds 107°C (225°F)

R-21 AA

- If carbon particles found in oil filter, service power turbine pressure oil fitting, screen and nozzle IAW TMI-2840-263-23, 72-50-00, para 5.F. service power turbine scavenge strut, and measure oil flow from power turbine scavenge oil strut.
- If main oil pressure is below limits as a result of oil overtemperature incident, remove and replace **Oil filter housing assembly** per TMI-2840-263-23, 72-60-00, para 1.D.
- Tag removed oil filter housing assembly with reason for removal.

- If not already done as part of cooling system troubleshooting, flush out aircraft oil lines and oil cooler
- Remove and replace scavenge oil filter element IAW (Similar to TM 55-1520-248-23, Task 4-4-17)
- Service engine oil system IAW (Similar to TM 55-1520-248-23, Task 1-4-5.1).

If oil pressure regulator housing was replaced, adjust main oil pressure regulator valve IAW TMI-2840-263-23, 72-60-00, para 3.A.

- Ground run engine for 10 minutes at light-on-skids power.
- Reinspect and clean the oil filter IAW TMI-2840-263-23, 72-60-00, para 1.C.
- Inspect and clean the magnetic chip detectors per Para 4.B.
- If carbon particles found in oil filter, service power turbine pressure oil fitting, screen, and nozzle IAW TMI-2840-263-23,72-50-00, para 5.F. service power turbine scavenge strut per and measure oil flow from power turbine scavenge oil strut per.
- After five hours of operation, reinspect the oil filter and magnetic chip detectors.
- If carbon particles found in oil filter, service power turbine pressure oil fitting, screen and nozzle IAW TMI-2840-263-23, 72-50-00, para 5.F. service power turbine scavenge strut per, and measure oil flow from power turbine scavenge oil strut per.

Return to service

R-21 BB

- Remove and **Replace engine** IAW (Similar to TM 55-1520-248-23, Tasks 4-1-1 and 4-1-2).
- Tag removed engine with information indicating that oil temperature limit was exceeded, and list maximum oil temperature reached and elapsed time limit exceeded.
- Service engine oil system IAW TMI-2840-263-23, 72-00-00,para 8.A., Lubrication System Servicing.
- Remove and replace scavenge oil filter element IAW (Similar to TM 55-1520-248-23, Task 4-4-17).
- If not already done as part of cooling system troubleshooting, flush out aircraft oil lines and oil cooler.

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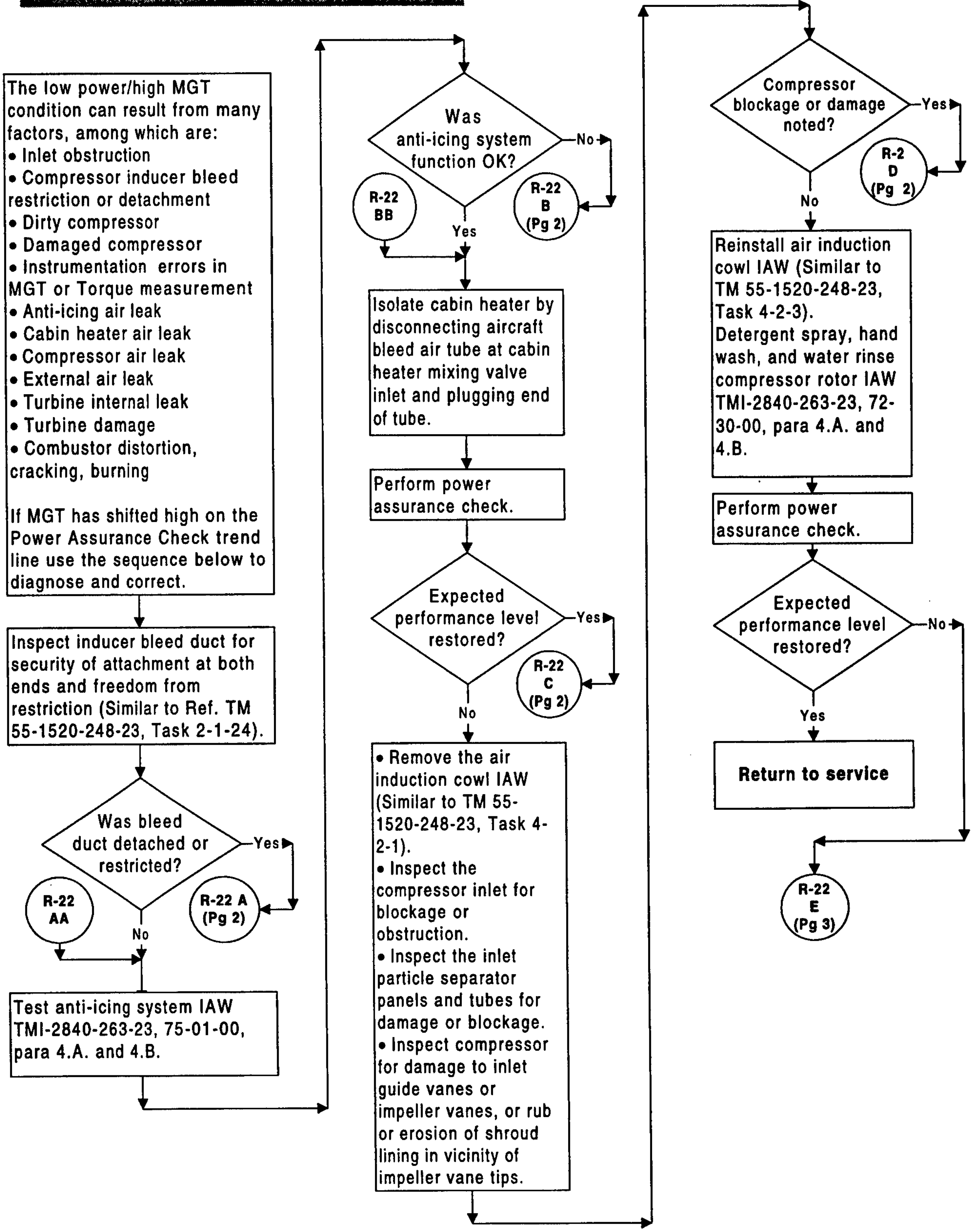
R-22. Power Low With High MGT



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R-22. Power Low With High MGT

R-22 A

Correct inducer bleed duct end attachment or restriction condition as required.

Perform power assurance check.

Expected performance level restored?
- No → R-22 AA (Pg 1)
- Yes → **Return to service**

R-22 B

Troubleshoot and correct anti-icing system problem IAW fault correction procedure R-1 (*Anti-icing System Operating Improperly*).

Perform power assurance check.

Expected performance level restored?
- No → R-22 BB (Pg 1)
- Yes → **Return to service**

R-22 C

Repair or replace aircraft heater mixing valve IAW (Similar to TM 55-1520-248-23, Tasks 13-1-1, 13-1-2, 13-1-3, 13-1-4, & 13-1-5, as applicable.) Remove plug and reconnect aircraft bleed air tube to mixing valve inlet.

Perform power assurance check.

Return to service

R-22 D

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove and **replace compressor module** IAW TMI-2804-263-23, 72-30-00, para 1.A. and 1.B. (This also requires removal and reinstallation of turbine module IAW TMI-2840-263-23, 72-50-00, para 1.A. and 1.B.)
- Identify replaced compressor module as having been subjected to inlet blockage and send to overhaul.
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).
- As a part of the check runs accompanying engine installation Task 4-1-2, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at take-off power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, 72-00-00, para 1.b., Diffuser Vent Orifice Selection.

Return to service

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R-22. Power Low With High MGT

R-22
E

Field-check the calibration of the cockpit MGT indicator as follows:

- Remove the two nuts from the MGT harness terminal block studs and lift off MGT harness leads and engine electrical harness leads (but leave signal leads from engine accessory harness attached to the studs).
- Using Thermocouple Calibrator (OMEGA Model CL-300-1000C-K [TBD] or equivalent), attach the chromel lead of the calibrator to the chromel terminal block stud and the alumel calibrator lead to the alumel terminal block stud.
- Reinstall the stud nuts, and torque to 18-24 in.-lb.
- Power up the aircraft with battery or APU.
- Set thermocouple calibrator to 800°C (1472°F) and observe and record MGT value displayed on the cockpit MGT indicator.
- Repeat above steps at calibrator settings of 700°C (1292°F) and 600°C (1112°F).
- MGT indications from cockpit digital MGT indicator should agree with the thermocouple calibrator within ± TBD °C (± TBD°F).

Cockpit MGT indicator agrees with calibrator?

No

Troubleshoot and repair aircraft wiring from engine accessory harness interface connector J16, pins L (alumel), M (chromel), and K (shield), to cockpit MGT indicator, IAW (Similar to TM 55-1520-248-23, Appendix K, Section IV).

Problems detected and corrected?

Yes

No

Replace cockpit MGT indicator IAW (Similar to TM 55-1520-248-23, Task 8-1-9).

Remove calibrator and reconnect MGT harness leads to terminal block, along with engine electrical and accessory harness MGT leads, and torque stud nuts to 18-24 in.-lb.

Perform power assurance check.

Return to service

Yes

Check torque indication as follows:

- Connect Maintenance Terminal (MT) and select Real Time Data display.
- Operate engine at light-on-skids power and simultaneously observe torque as indicated by MT and by cockpit torque indicator.

Do cockpit and MT torque values agree?

Yes

R-22
BBB
(Pg 4)

No

- Operate engine at Ground Idle. Loosen fittings at torquemeter pressure transducers for FADEC and cockpit, and bleed lines until solid oil flows, then tighten.
- Recheck agreement between MT and cockpit indicator at Light-On-Skids power.

Do cockpit and MT torque values agree?

No

R-22
AAA
(Pg 4)

Yes

Return to service

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R-22. Power Low With High MGT

R-22 AAA

- Remove and replace aircraft engine torque transducer IAW (Similar to TM 55-1520-248-23, Task 4-1-4)
- Recheck agreement between MT and cockpit indicator at Light-On-Skids power.

Do cockpit and MT torque values agree?

Yes → **Return to service**

No →

- Troubleshoot, remove, repair/replace, and reinstall cockpit torque indicator or related aircraft wiring, IAW (Similar to TM 55-1520-248-23, Appendix K, Section III, and Tasks 8.1.9 through 8.1.11).
- Recheck agreement between MT and cockpit indicator at Light-On-Skids power.

Return to service

R-22 BBB

Look for external engine air leaks as follows:

Start engine and operate at ground idle. Inspect for air leakage in the following areas and, if located, make repairs IAW the referenced tasks in TMI-2840-263-23, 72-30-00:

- COMPRESSOR SCROLL -- include flanges for aircraft bleed air off-take and unused bleed air off-take. Leakage from cracks in scroll, or from scroll-to-shroud or scroll-to-rear diffuser flanges are cause for compressor module replacement, which requires engine removal and reinstallation. Inspect - Repair allowable leaks - Para 3.D., and *(Similar to TM 55-1520-248-23, Task 4-1-5.)* Remove engine/replace compressor module/ reinstall engine - Tasks 3-1-1, 3-2-2, 5-1-2, & 5-1-3, and *(Similar to TM 55-1520-248-23, Tasks 4-1-1 & 4-1-2)*
- COMBUSTION MODULE -- Inspect / Remove/repair/ reinstall - TMI-2840-263-23, 72-40-00, para 1.A., 1.C. and 1.C.

Were leaks detected and corrected?

Yes → Perform power assurance check → **Return to service**

No →

- Remove combustion module IAW TMI-2840-263-23, 72-40-00,para 1.A.and 2.A.
- Inspect combustion outer case and liner IAW TMI-2840-263-23, para 1.C. and 2.B. respectively.
- Inspect first stage nozzle shield, nozzle, and turbine wheel IAW TMI-2840-263-23, 72-50-00, para 5.B. and 5.C.

Is turbine acceptable or repairable without teardown?

No → R-22 AAAA (Pg 5)

Yes →

- Install first stage nozzle shield (replace existing part if condition requires).
- If required, make repairs to outer combustion case IAW TMI-2840-263-23,72-40-00, para 2.B., (or replace).
- If required, make repairs to combustion liner IAW TMI-2840-263-23, 72-40-00, para 1.C. (or replace).
- Install combustion module IAW TMI-2840-263-23, 72-40-00, para 1.B. and 2.A.

R-22 BBBB (Pg 5)

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R-22. Power Low With High MGT

R-22 AAAA

- Remove engine IAW (Similar to TM55-1520-248-23, Task 4-1-1).
- Remove and **replace turbine module** IAW TMI-2840-263-23, 72-50-00, para 1.A. and 1.B.
- If required, make repairs to outer combustion case IAW TMI-2840-263-23, 72-40-00, para 2.b. (or replace).
- If required, make repairs to combustion liner IAW TMI-2840-263-23, 72-40-00, para 1.C. (or replace).
- Install combustion module IAW TMI-2840-263-23, 72-40-00, para 1.B. and 2.A.
- Reinstall engine IAW (Similar to TM55-1520-248-23, Task 4-1-2).

Perform power assurance check

Expected performance level restored?

Yes → **Return to service**

No →

- Remove engine IAW (Similar ot TM 55-1520-248-23, Task 4-1-1).
- Remove and **replace compressor module** IAW TMI-2840-263-23, 72-30-00, para 1.A. and 1.B. (This also requires removal and reinstallation of turbine module IAW MTI-2840-263-23, 72-50-00, para 1.A. and 1.B.)
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).
- As a part of the check runs accompanying engine installation Task 4-1-2, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, 72-00-00, pra 1.B., Diffuser Vent Orifice Selection.

Perform power assurance check.

Return to service

R-22 BBBB

Were combustion module parts changes/ repairs made?

No → (to R-22 AAAA procedure)

Yes →

Perform power assurance check.

Expected performance level restored?

No → (to R-22 AAAA procedure)

Yes → **Return to service**

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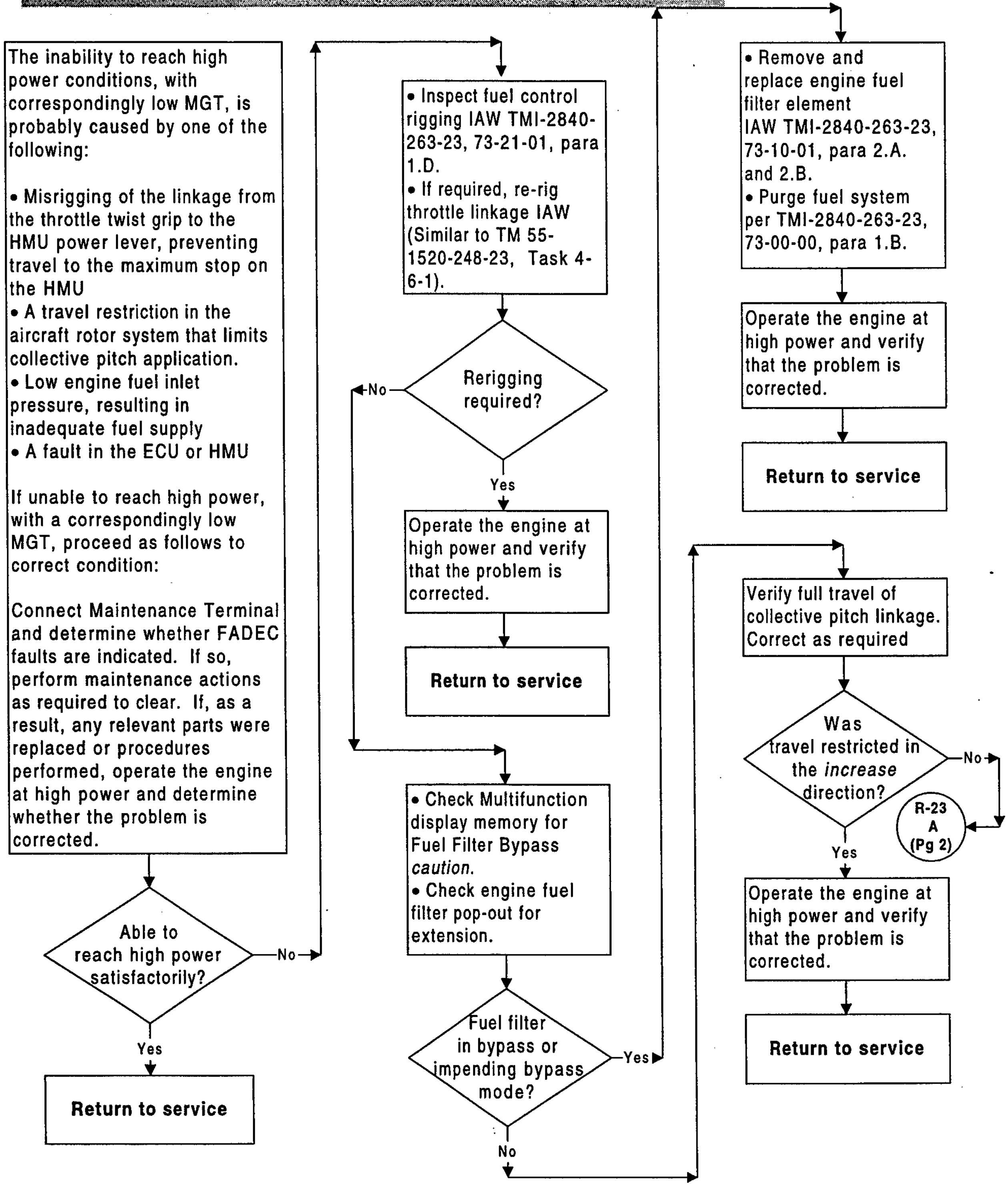
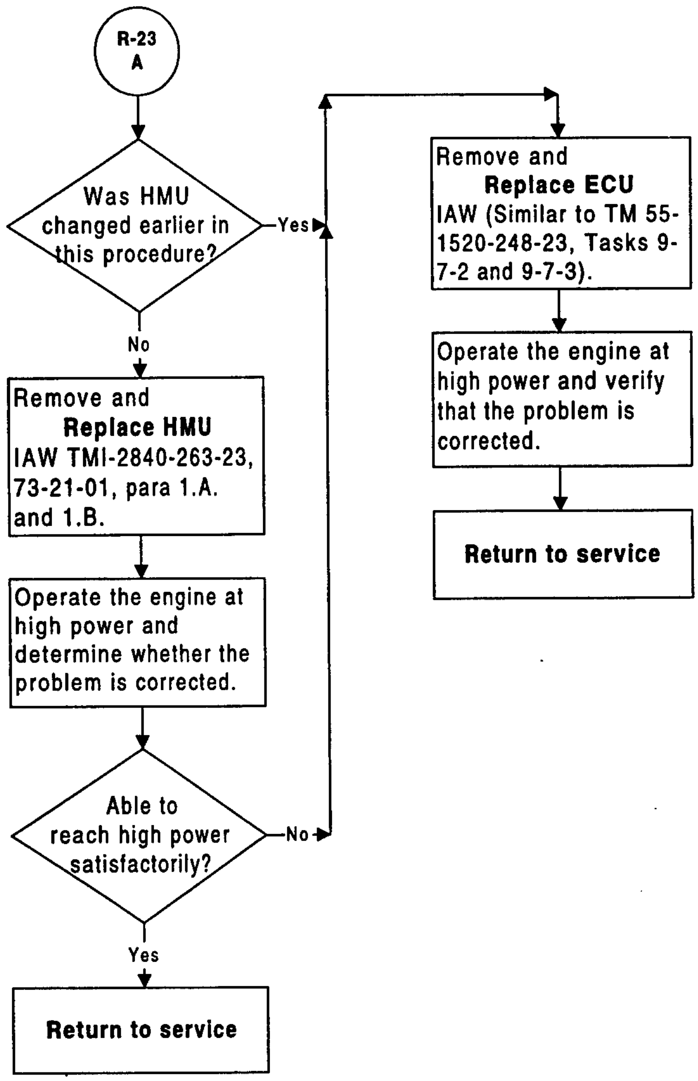
R-23. Power Low With MGT Below Maximum Limit



R-23. Power Low With MGT Below Maximum Limit



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R-24. Slow Acceleration/Np Droop

Loss of the FADEC droop anticipation feature results in greater than normal Np/Nr droop and a slight delay in the onset of acceleration during collective pulls.
A position potentiometer in the collective pitch linkage is the source of the droop anticipation signal. If misrigged or failed, delayed accelerations and increased Np/Nr droop will occur and the control system will declare a FADEC DEGRADE **Advisory** on the MFD. A failure within the ECU can also produce these same symptoms.

Connect the Maintenance Terminal and query the Display Faults (Static) page for Current and Last Run faults. A ***CPFlt*** should be listed (possibly along with other faults resulting from the primary CP position fault), or a fault related to an ECU failure.

- Troubleshoot the collective pitch signal fault problem by replacing the potentiometer and/or repairing faulty aircraft wiring, IAW (Similar to TM 55-1520-248-23, Appendix K, Section IV).
- If collective pitch potentiometer is replaced, rig per (Similar to TM 55-1520-248-23, Task 11-2-1, steps 18 through 26).

Clear any other maintenance faults indicated by the Maintenance Terminal.

Perform a check flight to verify satisfactory accelerations and Np/Nr droop.

Return to service

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R-25. Smoking During Steady State Operation

Continuous plumes or prolonged (several second) bursts of white (oil) smoke from the engine exhaust are probably the result of one or more of the below listed faults:

- Exhaust collector drain blocked
- Leaking No. 1 carbon seal
- Failed No. 1 bearing
- Blocked power turbine scavenge strut
- Defective turbine seals
- Leaking No. 5 labyrinth seal
- Restricted scavenge flow from turbine
- Restricted scavenge flow in aircraft system
- Leaking oil transfer tubes or check valve
- Faulty oil pump

In the absence of evidence suggesting a specific cause, proceed as follows to identify and resolve the problem.

Inspect the turbine exhaust collector for wetness, oil puddling, and drain blockage.

Oil in exhaust collector?

No

Yes

Exh. coll. drain or tubing obstructed?

No

R-25 A (Pg 2)

Yes

Correct obstruction and make check run to verify smoking eliminated.

Smoking eliminated?

No

Yes

Return to service

- Remove the air induction cowl IAW (Similar to TM 55-1520-248-23, Task 4-2-1).
- Inspect the compressor inlet for oil wetting of impeller or on inside of shroud.
- Inspect the inlet for looseness of impeller at No. 1 bearing area, for damage to inlet guide vanes or impeller vanes, or for rub or erosion of shroud lining in vicinity of impeller vane tips.

Looseness, oil wetting, or rub noted?

No

R-25 B (Pg 3)

Yes

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove and replace **Compressor module** IAW TMI-2840-263-23, 72-30-00, para 1.A. and 1.B. (this also requires removal and reinstallation of turbine module IAW TMI-2840-263-23, 72-50-00, para 1.A. and 1.B.).
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

Service engine oil system IAW TMI-2840-263-23, 72-00-00, para 8.A., Lubrication System Servicing. This includes the following:

- Drain oil tank (Similar to TM 55-1520-248-23,Task 1-4-5).
- Inspect oil tank for carbon, sludge, and deposits (Similar to TM 55-1520-248-23, Task 4-4-2).
- Remove, inspect, service, reinstall engine oil filter element (TMI-2840-263-23, 72-60-00, para 1.C.).
- Clean oil filter housing assembly (TMI-280-263-23, 72-60-00, para 1.D. and 2.F.).
- Remove, inspect, service, and reinstall side and bottom chip detectors (TMI-2840-263-23, 72-60-00, para 4.B).
- If contaminants noted in oil, remove, clean, and reinstall oil pressure reducer (TMI-2840-263-23, 72-00-00, para 8.A. Lubrication System Servicing), and flush aircraft oil lines and oil cooler.
- Remove and replace scavenge oil filter element IAW (Similar to TM 55-1520-248-23, Task 4-4-17).
- Service engine oil system IAW (TM 55-1520-248-23, Task 1-4-5.1).

As a part of the check runs accompanying engine installation Task 4-1-2, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove, and replace orifice with another size, IAW TMI-263-23, 72-00-00, para 1.B., Diffuser Vent Orifice Selection.

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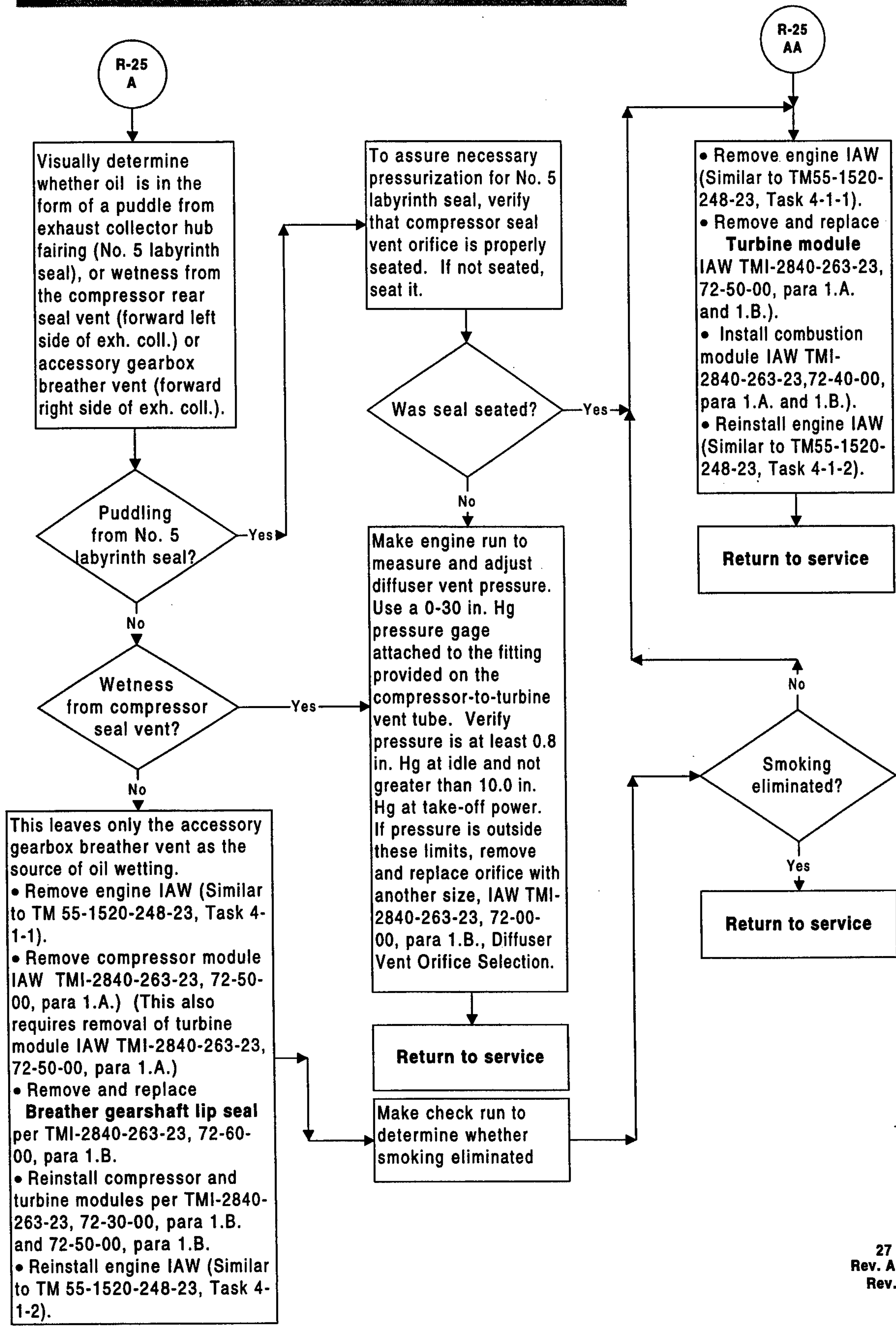
R-25. Smoking During Steady State Operation



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R-25. Smoking During Steady State Operation

R-25 B

Service power turbine support oil supply and scavenge details IAW following tasks of TMI-2840-263-23, 72-50-00, para 5.F.
- Remove power turbine pressure oil fitting, screen, and nozzle.
- Service power turbine pressure oil fitting, screen, and nozzle.
- Install power turbine pressure oil fitting, screen, and nozzle.
- Service power turbine scavenge oil strut.
- Remove and service scavenge oil sump.
- Measure oil flow from power turbine scavenge oil strut.
- Install scavenge oil sump.
- Measure engine oil system scavenge oil flow.

Oil system scavenge flow check OK? — No / Yes

Yes:

Make check run to determine whether smoking eliminated.

Smoking eliminated? — No: R-25 AA (Pg 2) / Yes:

Return to service

No:

Inspect scavenge return components in aircraft system (piping, oil cooler, oil cooler bypass valve, scavenge filter, tank, etc.) for possible restrictions, dents, or kinks, and correct as applicable Also check oil tank vent line. Replace scavenge oil filter element IAW (Similar to TM 55-1520-248-23, Task4-4-17).

Make check run to determine whether smoking eliminated.

Smoking eliminated? — No / Yes

Yes:

Return to service

No:

- Remove oil filter housing and check valve IAW TMI-2840-263-23, 72-60-00, para 1.D.
- Remove transfer tubes and inspect O-rings on both ends, as well as check valve O-rings.
- Inspect O-ring lands on transfer tubes and check valve for wear.
- Inspect bores in filter housing body and accessory gearbox housing (where transfer tubes and check valve are inserted) for wear.

- If O-ring land wear is noted on oil transfer tubes, replace **Oil transfer tubes**
- If O-ring land wear is noted on oil check valve, replace **Oil check valve**
- If transfer tube bore wear is noted in oil filter housing, replace **Oil filter housing**

Transfer tube bore wear in gearbox housing? — Yes: R-25 BB (Pg 4) / No

Were O-rings OK, all other related parts OK? — Yes: R-25 BB (Pg 4) / No

No:

Reinstall oil filter housing, transfer tubes, and check valve IAW TM 55-2840-256-23, Task 6-2-4*, using all new O-rings and gasket.

- Make check run to verify smoking eliminated.
- If oil filter housing was replaced, measure and adjust main oil pressure IAW TMI-2840-263-23, 72-60-00, para 3.A.

Return to service

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R-25 BB

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove and replace **Accessory gearbox module** IAW TMI-2840-263-23, 72-60-00, para 1.A. (This requires removal and reinstallation of compressor and turbine modules IAW TMI-2840-263-23, 72-30-00, para 1.A., 1.B. and 72-50-00, para 1.A. and 1.B.).
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

↓

Measure and adjust main oil pressure IAW TM 55-2840-256-23, Tasks 1-8-12 and 6-2-9.

↓

Return to service

R-26. Smoking During Transients

During deceleration, a brief puff of smoke is not abnormal, but a prolonged plume existing for most or all of the deceleration *is* cause for corrective action. Among the causes of smoking on deceleration are:

- Exhaust collector drain blocked
- Blocked power turbine scavenge strut
- Defective turbine seals
- Leaking No. 5 labyrinth seal
- Restricted scavenge flow from turbine
- Restricted scavenge flow in aircraft system
- Leaking oil transfer tubes or check valve
- Faulty oil pump

In the absence of evidence suggesting a specific cause, proceed as follows to identify and resolve the problem.

Inspect the turbine exhaust collector for wetness, oil puddling, and drain blockage.

Oil in exhaust collector?

Yes

Exh. coll. drain or tubing obstructed?

No → R-26 A (Pg 2)

Yes

Correct obstruction and make check run to verify smoking eliminated

Smoking eliminated?

Yes → **Return to service**

No → R-26 A (Pg 2)

(Oil in exhaust collector?) No →

Service power turbine support oil supply and scavenge details IAW following tasks of TMI-2840-263-23, 72-50-00, para 5.F.
- Remove power turbine pressure oil fitting, screen, and nozzle.
- Service power turbine pressure oil fitting, screen, and nozzle.
- Install power turbine pressure oil fitting, screen, and nozzle.
- Service power turbine scavenge oil strut.
- Remove and service scavenge oil sump.
- Measure oil flow from power turbine scavenge oil strut.
- Install scavenge oil sump.
- Measure engine oil system scavenge oil flow.

Oil system scavenge flow check OK?

Yes →

Make check run to determine whether smoking eliminated.

Smoking eliminated?

No → R-26 B (Pg 2)

Yes

Return to service

(Oil system scavenge flow check OK?) No →

Inspect scavenge return components in aircraft system (piping, oil cooler, oil cooler bypass valve, scavenge filter, tank, etc.) for possible restrictions, dents, or kinks, and correct as applicable Also check oil tank vent line. Replace scavenge oil filter element IAW (Similar to TM 55-1520-248-23, Task4-4-17).

Make check run to determine whether smoking eliminated.

Smoking eliminated?

No → R-26 C (Pg 3)

Yes

Return to service

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R-26. Smoking During Transients

R-26 A

Visually determine whether oil is in the form of a puddle from exhaust collector hub fairing (No. 5 labyrinth seal), or wetness from the compressor rear seal vent (forward left side of exh. coll.) or accessory gearbox breather vent (forward right side of exh. coll.).

Puddling from No.5 labyrinth seal?

Yes

To assure necessary pressurization for No. 5 labyrinth seal, verify that compressor seal vent orifice is properly seated. If not seated, seat it.

Was seal seated?

Yes

No

No

Wetness from compressor seal vent?

Yes

Make engine run to measure and adjust diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, 72-00-00, para 1.B., Diffuser Vent Orifice Selection.

Return to service

No

This leaves only the accessory gearbox breather vent as the source of oil wetting.

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove compressor module IAW TMI-2840-263-23, 72-30-00, para 1.A. (This also requires removal of turbine module IAW TMI-2840-263-23, 72-50-00, para 1.A.).
- Remove and replace **Breather gearshaft lip seal** per TMI-2840-263-23,72-60-00, para 1.B.
- Reinstall compressor and turbine modules per TMI-2840-263-23, para 1.B. and 72-50-00, para 1.B.
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

Make check run to determine whether smoking eliminated.

Smoking eliminated?

Yes

Return to service

No

R-26 B

- Remove engine IAW (Similar to TM55-1520-248-23, Task 4-1-1).
- Remove and replace **Turbine module** IAW TMI-2840-263-23, 72-50-00, para 1.A.and 1.B.).
- Install combustion module IAW TMI-2840-263-23, 72-40-00, para 1.A. and 2.A.
- Reinstall engine IAW (Similar to TM55-1520-248-23, Task 4-1-2).

Return to service

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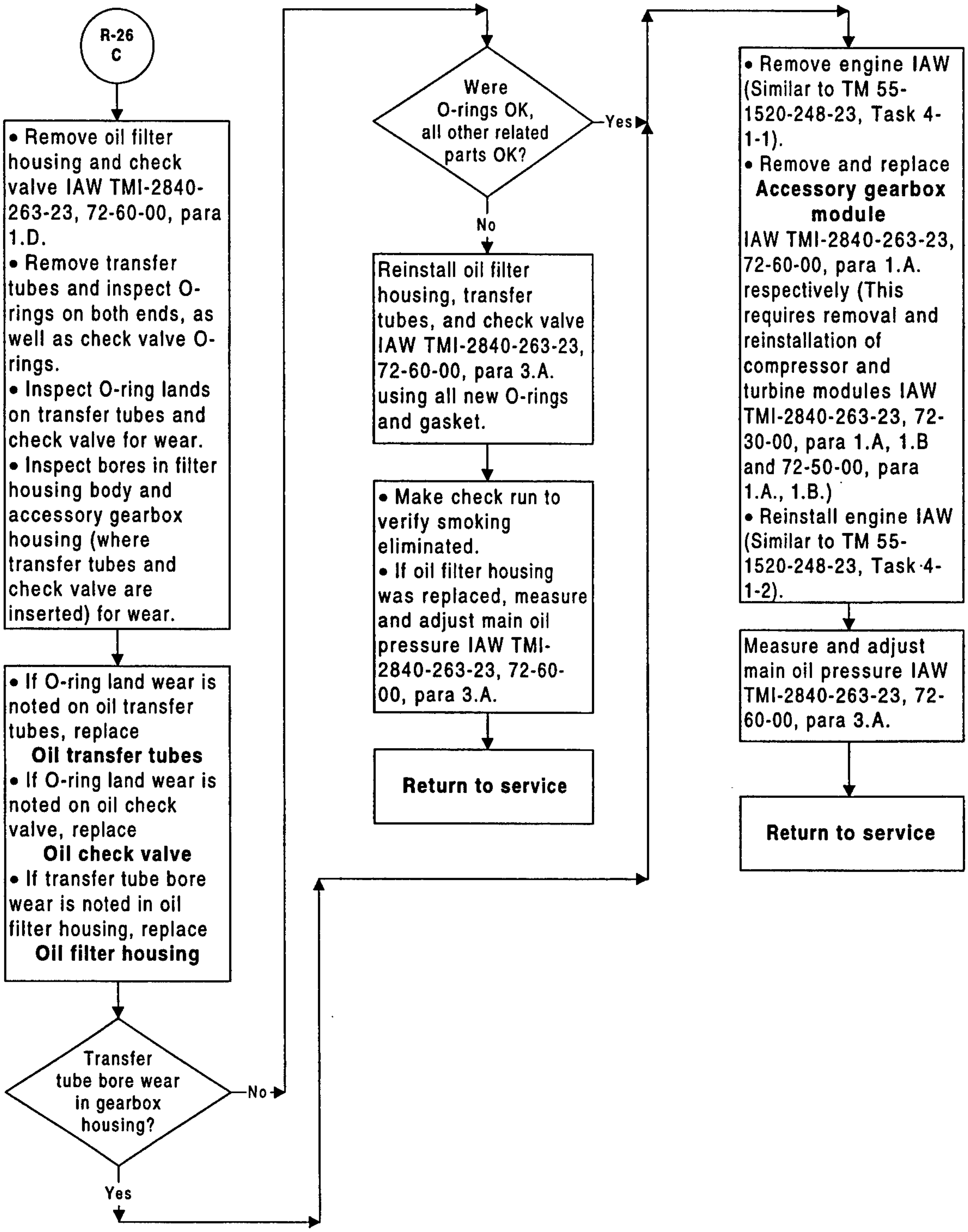
R-26. Smoking During Transients



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R-27. Faulty Torquemeter Indication

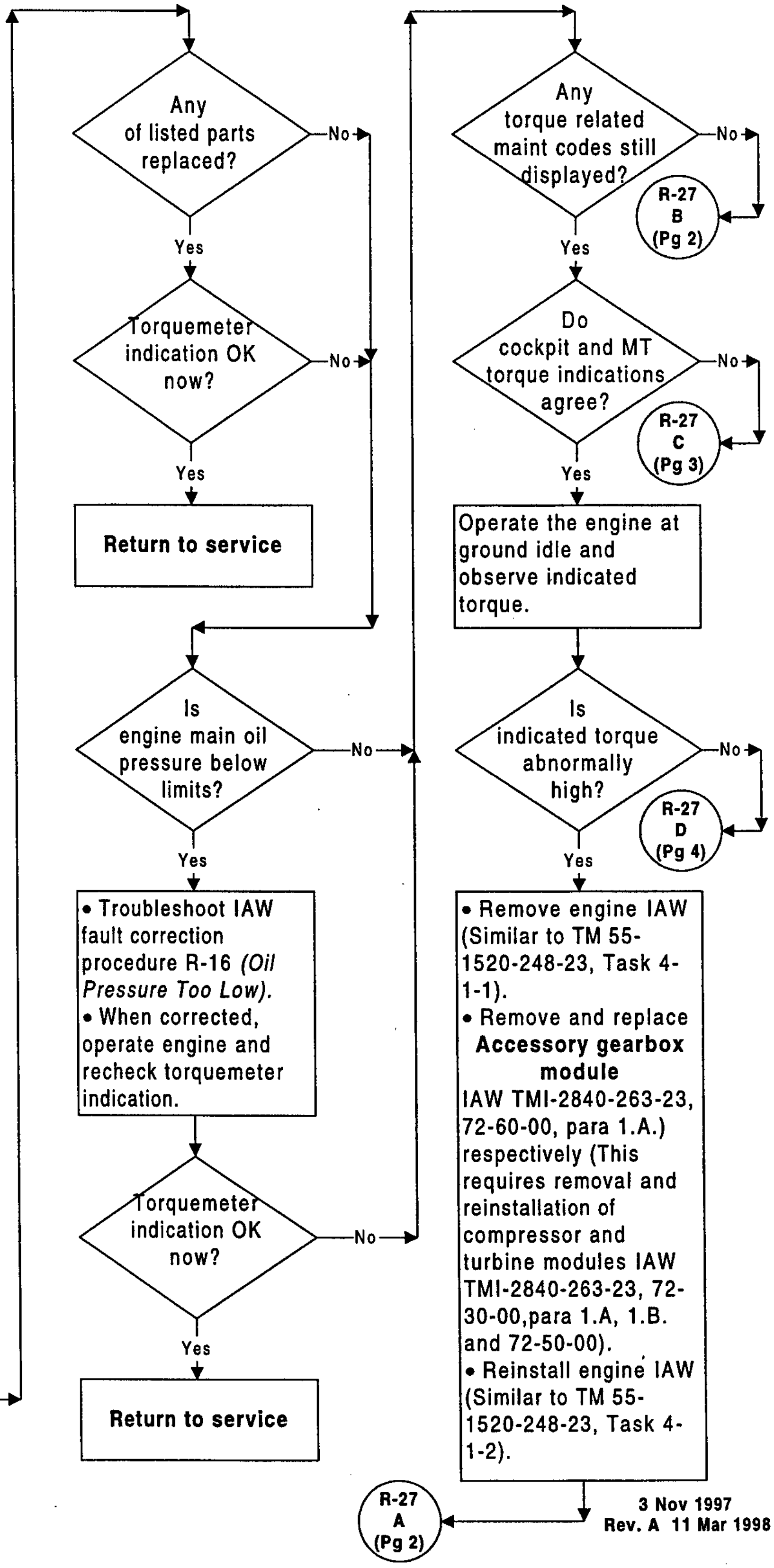
Faulty engine torquemeter indication can be of several kinds -- for example: an erroneous cockpit instrumentation indication; a problem with FADEC torque measurement; or a faulty engine pressure signal to both the cockpit system and the FADEC. A FADEC-related torque problem will probably result in a **FADEC Degrade** Advisory and subsequent MAINTENANCE FAULT messages accessible through the MFD or the Maintenance Terminal. Problems with the cockpit indication system usually rely on the pilot for recognition.

Causes of faulty torquemeter indication include the following:

- Aircraft or FADEC torquemeter pressure transducer fault
- Aircraft torque indicator fault
- Aircraft wiring fault between transducer and indicator
- Engine harness or interface harness between transducer and ECU
- Obstruction in tubing between engine and aircraft or FADEC torquemeter pressure transducer
- Low engine main oil pressure
- Faulty engine torquemeter
- ECU

If torque indication problems are encountered, connect the Maintenance Terminal (MT) and determine whether FADEC faults are indicated. If so, perform maintenance actions to clear. If, as a result of a fault indication(s), any of the following were replaced, perform an engine check run and determine whether the torquemeter indication problem still exists:

- ECU
- Engine Electrical Harness
- Engine Interface Harness
- Engine Torquemeter Pressure Transducer



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R-27. Faulty Torquemeter Indication

R-27 A

Measure and adjust main oil pressure IAW TMI-2840-263-23, 72-60-00, para 3.A.

Return to service

R-27 B

- Operate engine at ground idle. Loosen fittings at torquemeter pressure transducers for FADEC and cockpit, and bleed lines until solid oil flows, then tighten.
- Recheck agreement between MT and cockpit indicator at light-on-skids power.

Do cockpit and MT torque indications agree?

Yes → **Return to service**

No →

- Replace the aircraft torquemeter pressure transducer IAW (Similar to TM 55-1520-248-23, Task 4-1-4)
- Operate engine at ground idle. Loosen fittings at torquemeter pressure transducers for FADEC and cockpit, and bleed lines until solid oil flows, then tighten.
- Recheck agreement between MT and cockpit indicator at light-on-skids power.

Do cockpit and MT torque indications agree?

Yes → **Return to service**

No →

- Troubleshoot aircraft wiring to cockpit torque indicator IAW (Similar to TM 55-1520-248-23, Appendix K, Section IV).
- If problem not located in wiring, replace cockpit torque indicator IAW (Similar to TM 55-1520-248-23, Task 8-1-9).
- Recheck agreement between MT and cockpit indicator at light-on-skids power.

Do cockpit and MT torque indications agree?

Yes → **Return to service**

No →

- Replace FADEC torquemeter pressure transducer.
- Recheck agreement between MT and cockpit indicator at light-on-skids power.

Do cockpit and MT torque indications agree?

Yes → **Return to service**

No → R-27 AA (Pg 3)

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R-27. Faulty Torquemeter Indication

R-27 AA

- Troubleshoot and repair or replace engine electrical harness IAW TMI-2840-263-23, 73-21-00, para 2.A. and 2.B.
- If required, troubleshoot and repair engine interface harness IAW (Similar to TM 55-1520-248-23, Appendix K, Section IV).
- Recheck agreement between MT and cockpit indicator at light-on-skids power.

Do cockpit and MT torque indications agree?

Yes → **Return to service**

No → Remove and **Replace ECU** IAW (Similar to TM 55-1520-248-23, Tasks 9-7-2 and 9-7-3).

Operate the engine at light-on-skids power and verify that the problem is corrected.

Return to service

R-27 C

- Operate engine at ground idle. Loosen fittings at torquemeter pressure transducers for FADEC and cockpit, and bleed lines until solid oil flows, then tighten.
- Recheck agreement between MT and cockpit indicator at light-on-skids power.

Do cockpit and MT torque indications agree?

Yes → **Return to service**

No →

- Replace FADEC torquemeter pressure transducer.
- Recheck agreement between MT and cockpit indicator at light-on-skids power.

Do cockpit and MT torque indications agree?

Yes → **Return to service**

No →

- Troubleshoot and repair or replace engine electrical harness IAW TMI-2840-263-23, 73-21-00, para 2.A. and 2.B.
- If required, troubleshoot and repair engine interface harness IAW (Similar to TM 55-1520-248-23, Appendix K, Section IV).
- Recheck agreement between MT and cockpit indicator at light-on-skids power.

Do cockpit and MT torque indications agree?

Yes → **Return to service**

No →

Any torque related maint codes still displayed?

No → R-27 AAA (Pg 4)

Yes → Remove and **Replace ECU** IAW (Similar to TM 55-1520-248-23, Tasks 9-7-2 and 9-7-3).

Operate the engine at light-on-skids power and verify that the problem is corrected. → **Return to service**

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R-27. Faulty Torquemeter Indication

R-27 AAA

- Replace the aircraft torquemeter pressure transducer IAW (Similar toTM 55-1520-248-23, Task 4-1-4).
- Operate engine at ground idle. Loosen fittings at torquemeter pressure transducers for FADEC and cockpit, and bleed lines until solid oil flows, then tighten.
- Recheck agreement between MT and cockpit indicator at light-on-skids power.

Do cockpit and MT torque indications agree?

Yes

Return to service

No

- Troubleshoot aircraft wiring to cockpit torque indicator IAW (Similar to TM 55-1520-248-23, Appendix K, Section IV).
- If problem not located in wiring, replace cockpit torque indicator IAW (Similar to TM 55-1520-248-23, Task 8-1-9).
- Recheck agreement between MT and cockpit indicator at light-on-skids power.

Return to service

R-27 D

- Operate engine at ground idle. Loosen fittings at torquemeter pressure transducers for FADEC and cockpit, and bleed lines until solid oil flows, then tighten.
- Recheck agreement between MT and cockpit indicator at light-on-skids power.

Any torque related maint codes still displayed?

No

Return to service

Yes

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove and replace **Accessory gearbox module** IAW TMI-2840-263-23, 72-60-00, para 1.A. respectively. (This requires removal and reinstallation of compressor and turbine modules IAW TMI-2840-263-23, 72-30-00, para 1.A., 1.B., and 72-50-00, para 1.A., 1.B.)
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

Measure and adjust main oil pressure IAW TM 55-2840-256-23, Tasks 1-8-12 and 6-2-9.

Return to service

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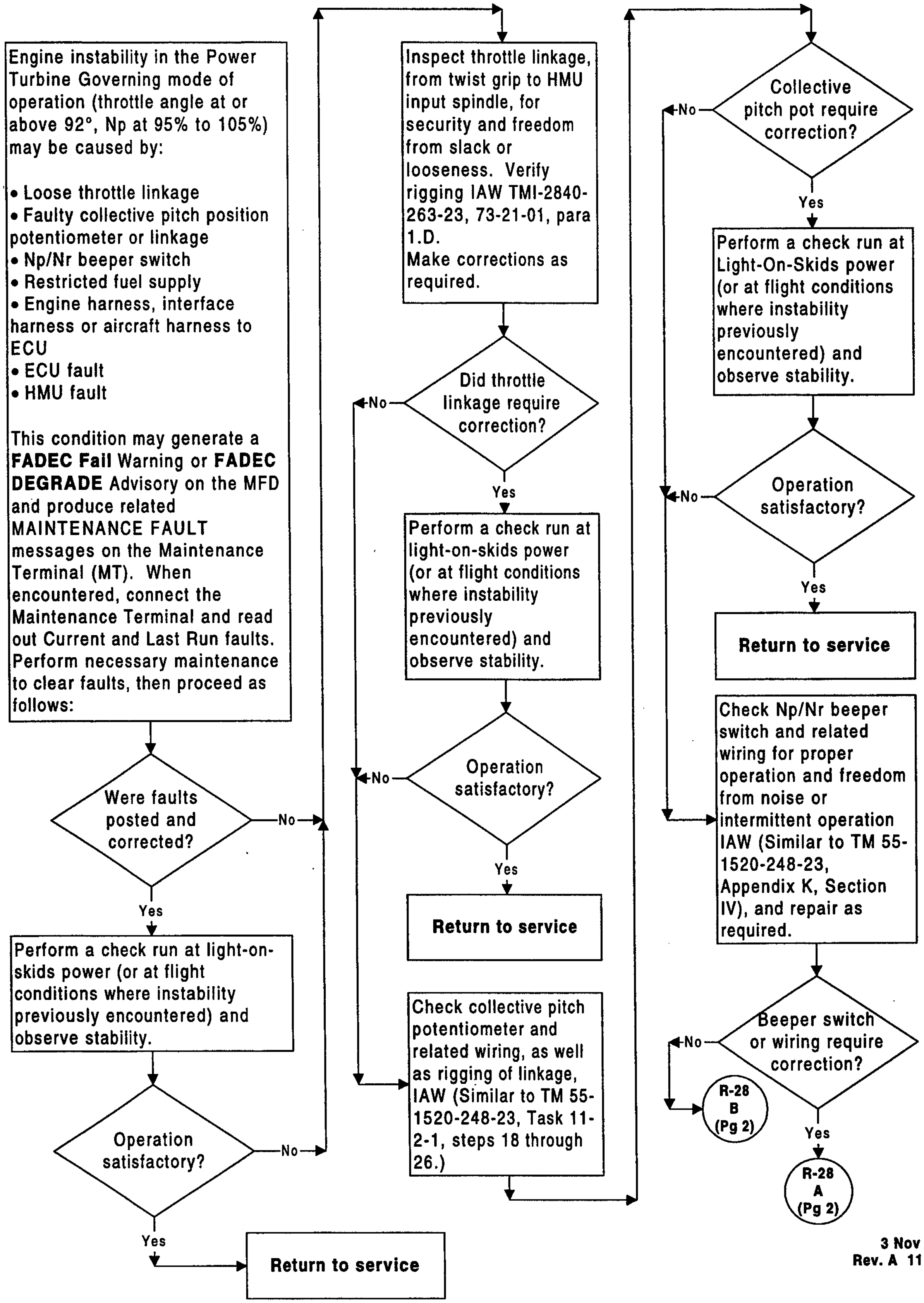
R-28. Unstable In Power Turbine Governing (95% - 105% Np)



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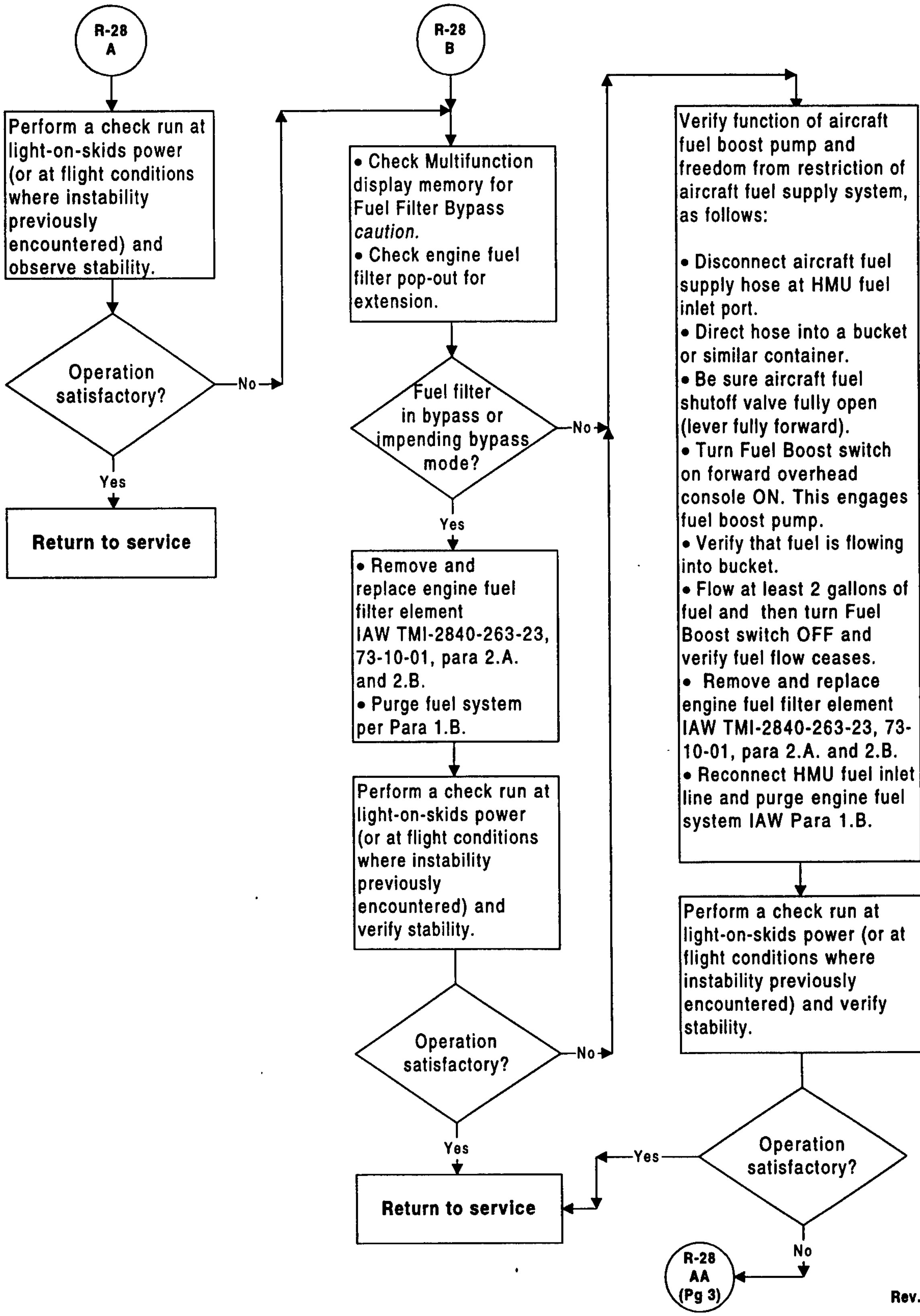
R-28. Unstable In Power Turbine Governing (95% - 105% Np)



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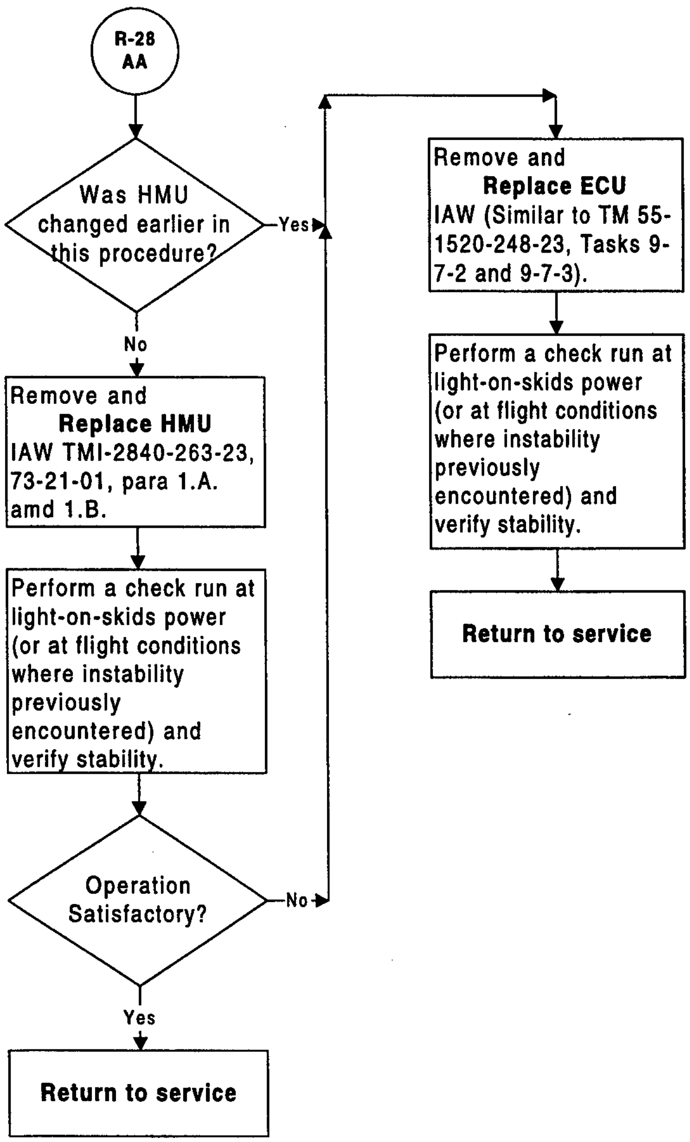

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R-29. Unstable At Ground Idle

Engine instability at Ground Idle (PLA at 30° to 40°, Ng at 64%) may be caused by:

- Loose throttle linkage
- Restricted fuel supply
- Engine Electrical Harness, Interface Harness or aircraft wiring to ECU
- Intermittant Ng speed pick-up or cockpit Np indicator
- ECU fault
- HMU fault

This condition may generate a **FADEC Fail** Warning or **FADEC DEGRADE** Advisory on the MFD and produce related MAINTENANCE FAULT messages on the Maintenance Terminal (MT). When encountered, connect the Maintenance Terminal and read out Current and Last Run faults. Perform necessary maintenance to clear faults, then proceed as follows:

Were faults posted and corrected?

No

Yes

Perform a check run at ground idle and observe stability.

Operation satisfactory?

No

Yes

Return to service

Set MT to the Real Time Data -- Analog Parameters page.

- During unstable operation at ground idle, observe cockpit displays of Ng, Np, Torque, and MGT.
- Also observe MT displays of the same parameters.

Does instability show in parameters other than Ng?

No

R-29 A (Pg 2)

Yes

This indicates instability is real.

- Inspect throttle linkage, from twist grip to HMU input spindle, for security and freedom from slack or looseness.
- Verify rigging IAW TMI-2840-263-23, 73-21-01,para 1.D.
- Make corrections as required.

Did throttle linkage require corrective action?

Yes

No

Perform a check run at ground idle and observe stability.

Operation satisfactory?

No

Yes

Return to service

- Check Multifunction display memory for Fuel Filter Bypass *caution.*
- Check engine fuel filter pop-out for extension.

Fuel filter in bypass or impending bypass mode?

No

R-29 C (Pg 2)

Yes

- Remove and replace engine fuel filter element IAW TMI-2840-263-23, 73-10-01, para 2.A.and 2.B.
- Purge fuel system per Para 1.B.

R-29 B (Pg 2)

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R-29. Unstable At Ground Idle

R-29 A

Lack of response in other parameters indicates instability is an Ng indication problem, not actual instability. Since no Ng-related fault shows on MT, problem must be in cockpit Ng indicator (Multiparameter Display Unit -- MDU) or in aircraft wiring between ECU and MDU.

- Troubleshoot aircraft wiring from connector P2 (at ECU) to the cockpit speed indicator (MDU), IAW (Similar to TM 55-1520-248-23, Appendix K, Section IV).

If no problem located:

- Replace or repair Multiparameter Display Unit Ng channel IAW (Similar to TM 55-1520-248-23, Tasks 8-1-5, 8-1-6, 8-1-7, and 8-1-8).

Operate the engine at ground idle and verify that no instability is indicated.

Return to service

R-29 B

Operate the engine at ground idle and determine whether instability has been eliminated.

Operation satisfactory?

No

Yes

Return to service

R-29 C

Verify function of aircraft fuel boost pump and freedom from restriction of aircraft fuel supply system, as follows:

- Disconnect aircraft fuel supply hose at HMU fuel inlet port.
- Direct hose into a bucket or similar container.
- Be sure aircraft fuel shutoff valve fully open (lever fully forward).
- Turn Fuel Boost switch on forward overhead console ON. This engages fuel boost pump.
- Verify that fuel is flowing into bucket.
- Flow at least 2 gallons of fuel and then turn Fuel Boost switch OFF and verify fuel flow ceases.
- Remove and replace engine fuel filter element IAW TMI-2840-263-23, 73-10-01, para 2.A. and 2.B.
- Reconnect HMU fuel inlet line and purge engine fuel system IAW Para 1.B.

Operate the engine at ground idle and determine whether instability has been eliminated.

Operation satisfactory?

No

Yes

Return to service

R-29 AA (Pg 3)

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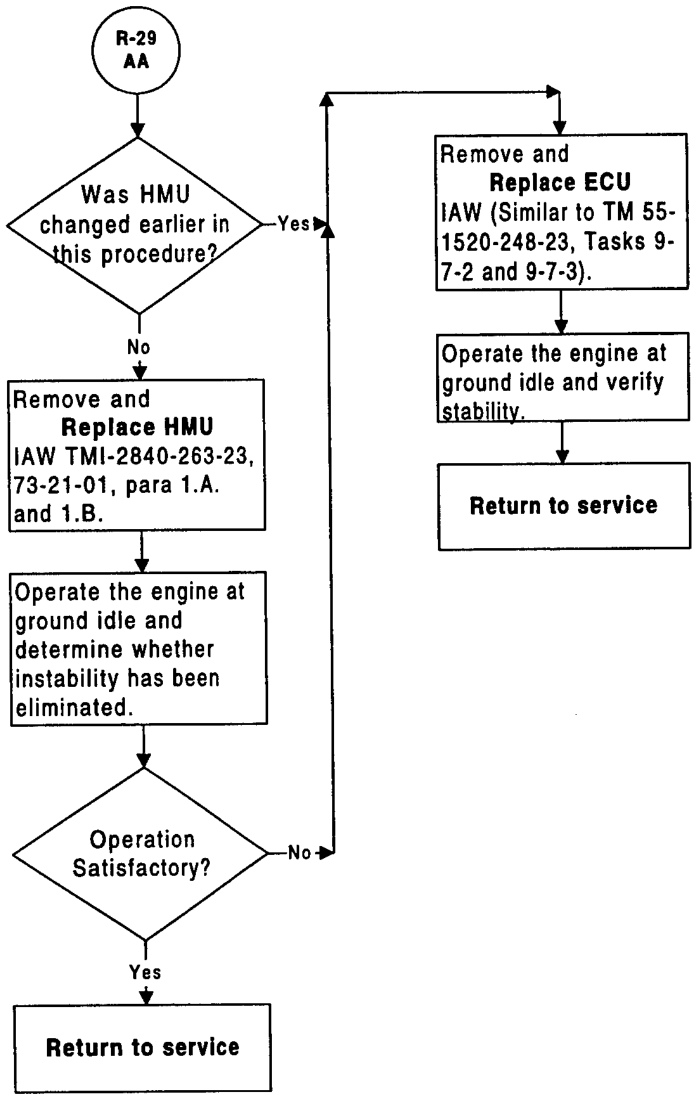
R-29
AA
Was HMU changed earlier in this procedure?
Yes
No
Remove and
Replace HMU
IAW TMI-2840-263-23, 73-21-01, para 1.A. and 1.B.
Operate the engine at ground idle and determine whether instability has been eliminated.
Operation Satisfactory?
No
Yes
Return to service
Remove and
Replace ECU
IAW (Similar to TM 55-1520-248-23, Tasks 9-7-2 and 9-7-3).
Operate the engine at ground idle and verify stability.
Return to service

R-30. Excessive Vibration

Engine vibration can occur as the result of many factors, the primary ones of which are listed below:

- Loose engine mounts
- Accessory unbalance
- Engine rotor system unbalance (gas generator or power turbine)
- Gear tooth mesh
- Gear unbalance
- Bearing failure
- Response to aircraft rotor system, or to drive system unbalance or alignment

The presence of vibration is sometimes difficult to detect by touch or sound (depending upon frequency and amplitude) but it makes itself known by unusual wear and fretting of external parts and equipment, loosening of nuts, bolts, fasteners, and fittings, etc.

If the existence of higher than normal vibration is known or suspected, take the following actions.

Check the engine mounts for looseness (accessory gearbox side and bottom mounts and turbine mount), and tighten as required (Similar to Ref. TM 55-1520-248-23, Task 4-7-1).

Were mounts loose?

Yes

Torque mounts and conduct vibration check IAW TM 1-2840-263-23 72-00-00 Para 2.A.

Use a vibration anaylzer such as a Chadwick-Helmuth Model 192 with Model 7570 High Temperature Accelerometers. Other equipment may also be used.

Does vibration still exist?

No

Return to service

Yes

No

Conduct vibration check IAW TMI-2840-263-23 72-00-00 Para 2A to verify engine caused vibration.

Is vibration engine caused?

Yes

R30 A pg 2

No

Refer to applicable aircraft troubleshooting porcedures.

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R-30. Excessive Vibration

R30 A

• Remove the air induction cowl IAW (Similar to TM 55-1520-248-23, Task 4-2-1)
• Inspect compressor inlet for indications of impeller vane damage or looseness in front (No. 1) bearing area.

Impeller looseness noted?

Yes

• Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
• Remove and replace
Compressor module
IAW TMI-2840-263-23, 72-30-00, para 1.A. and 1.B. (this also requires removal and reinstallation of turbine module IAW TMI-2840-263-23, 72-50-00, para 1.A. and 1.B.).
• Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

Service engine oil system IAW TMI-2840-263-23, 72-00-00, para 8.A., Lubrication System Servicing. This includes the following:
• Drain oil tank (Similar to TM 55-1520-248-23,Task 1-4-5).
• Inspect oil tank for carbon, sludge, and deposits (Similar to TM 55-1520-248-23, Task 4-4-2).
• Remove, inspect, service, reinstall engine oil filter element (TMI-2840-263-23, 72-60-00, para 1.C.).
• Clean oil filter housing assembly (TMI-2840-263-23, 72-60-00, para 1.D).
• Remove, inspect, service, and reinstall side and bottom chip detectors (TMI-2840-263-23, 72-60-00, para 4.B).
• If contaminants noted in oil, remove, clean, and reinstall oil pressure reducer (TMI-2840-263-23, 72-00-00,para 8.A. Lubrication System Servicing), and flush aircraft oil lines and oil cooler.
• Remove and replace scavenge oil filter element IAW (Similar to TM 55-1520-248-23, Task 4-4-17).
• Service engine oil system IAW (Similar to TM 55-1520-248-23, Task 1-4-5.1).

As a part of the check runs accompanying engine installation Task 4-1-2*, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at take-off power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, 72-00-00, para 1.B., Diffuser Vent Orifice Selection.

Return to service

No

Impeller vane(s) damaged or missing?

Yes

R-30 C (Pg 5)

No

R-30 B (Pg 3)

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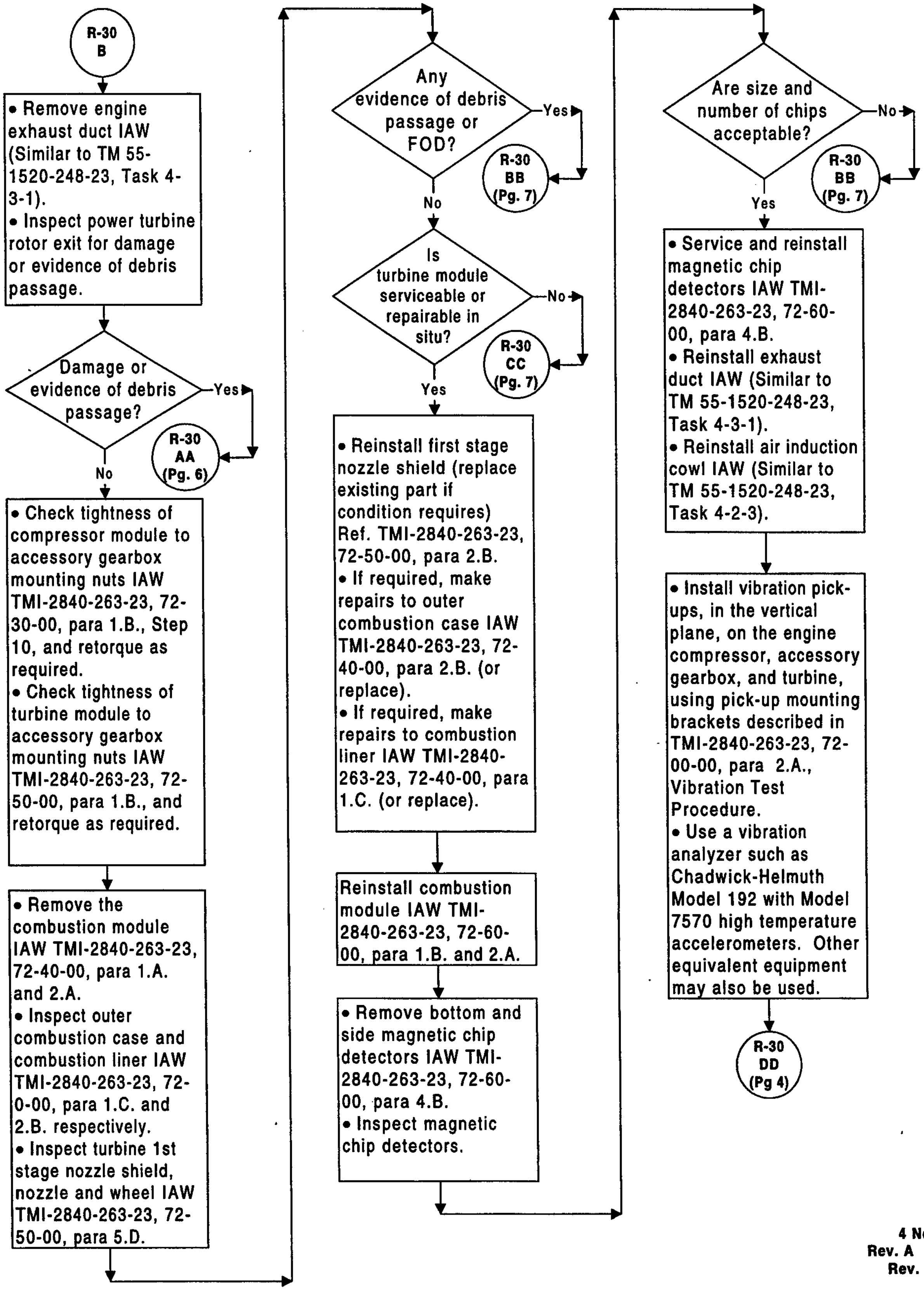
R-30. Excessive Vibration



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R-30. Excessive Vibration

R-30 DD

• Operate the engine at the conditions specified in TMI-2840-263-23, 72-00-00, para 6, Operating Limits, and acquire data to determine:
Overall Vibration Levels and Discrete Vibration as a function of frequency at the steady state points
and
Peak Overall Vibration Levels at the defined transient conditions

• Examine recordings for limits exceedences (and for significant changes if baseline data exists). At those peak conditions, note associated frequencies and attempt to relate them to known engine and aircraft conditions and characteristics.
• If the characteristic frequency of the high vibration is in the range of the aircraft power train, rotor system, or tail rotor system (all usually at or below 100 Hz),
Follow applicable aircraft maintenance procedures
(Engine remains in service)

Does this describe actual situation?
Yes → **Return to service**
No →

If the high vibration occurs on the turbine and its frequency is power turbine or gas generator rotational, proceed as follows:

· Remove engine IAW (Similar to TM55-1520-248-23, Task 4-1-1).
· Remove and replace
Turbine module
IAWTM55-2840-256-23, Tasks 5-1-2* and 5-1-3*).
· Install combustion module IAW TMI-2840-263-23, 72-40-00, para 1.A., 1.B., and 2.B.
· Reinstall engine IAW (Similar to TM55-1520-248-23, Task 4-1-2).

Does this describe actual situation?
Yes → **Return to service**
No →

If the high vibration occurs on the compressor and its frequency is gas generator rotational, proceed as follows:

• Remove engine IAW (Similar to TM55-1520-248-23, Task 4-1-1.)
• Remove and replace
Compressor module
IAW TMI-2840-263-23, 72-30-00, para 1.A. and 1.B. (This also requires removal and reinstallation of turbine module IAW TMI-2840-263-23, 72-50-00, 1.A. and 1.B.)
• Reinstall engine IAW (Similar to TM55-1520-248-23, Task 4-1-2).

As a part of the check runs accompanying engine installation Task 4-1-2, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, 72-00-00, para 1.B. Diffuser Vent Orifice Selection.

Does this describe actual situation?
Yes → **Return to service**
No →

If the high vibration occurs on the accessory gearbox and the frequency is that of an engine driven accessory, particularly the starter-generator, proceed as follows:

• Replace the
Accessory in question
• Repeat the vibration survey

R-30 AAA (Pg 5)

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R-30. Excessive Vibration

R-30 AAA

Vibration within limits?

No

Yes

Return to service

If the high vibration occurs on the accessory gearbox and frequency is gear rotational or gear tooth mesh, proceed as follows:

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove and replace **Accessory gearbox module** IAW TMI-2840-263-23, 72-60-00, para 1.A., respectively. (This requires removal and reinstallation of compressor and turbine modules IAW TMI-2840-263-23,72-30-00, para 1.A,1.B. and 72-50-00, para 1.A., 1.B.)
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

Measure and adjust main oil pressure IAW TMI-2840-263-23, 72-00-00, para 8.A., Lubrication System Servicing and 72-60-00, para 3.A.

Return to service

R-30 C

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1.)
- Remove bottom and side magnetic chip detectors IAW TMI-2840-263-23, 72-60-00, para 4.B.
- Inspect magnetic chip detectors

Are size and number of chips acceptable?

Yes

No

Replace engine
IAW (Similar to TM 55-1520-248-23, Task 4-1-2)

- Service and reinstall magnetic chip detectors IAW TMI-2840-263-23, 72-60-00,para 4.B.
- Remove Compressor module IAW TMI-2840-263-23, 72-30-00, para 1.A.
- Remove turbine module IAW TMI-2840-263-23, 72-50-00, para 1.A.
- Remove combustion module IAW TMI-2840-263-23, 72-40-00, para 1.A. and 2.A.
- Inspect for evidence of debris passage from compressor into combustion section and turbine.

Evidence of debris passage noted?

No

R-30 AAAA (Pg 6)

Yes

Replace engine
IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

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R-30. Excessive Vibration

R-30 AAAA

- Inspect outer combustion case and combustion liner IAWTMI-2840-263-23, 72-40-00, para 1.C. and 2.B. respectively.
- Inspect turbine 1st stage nozzle shield, nozzle and wheel IAW TMI-2840-263-23, 72-50-00, para 5.C. and 5.D.
- Reinstall first stage nozzle shield (replace existing part if condition requires) Ref.TMI-2840-263-23, 72-50-00, para 2.B.
- If required, make repairs to outer combustion case IAW TMI-2840-263-23, 72-40-00, para 2.B. (or replace).
- If required, make repairs to combustion liner IAW TMI-2840-263-23, 72-40-00, para 1.C. (or replace).

↓

- Reinstall combustion module IAW TMI-2840-263-23, 72-40-00, para 1.B. and 12.A.
- Replace **Compressor module** IAW TMI-2840-263-23, 72-30-00, para 1.A. and 1.B.
- Install turbine module IAW TMI-2840-263-23, 72-50-00, para 1.B.
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

↓

As a part of the check runs accompanying engine installation Task 4-1-2, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, para 1.B., Diffuser Vent Orifice Selection.

↓

Return to service

R-30 AA

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1.*
- Remove bottom and side magnetic chip detectors IAW TMI-2840-263-23, 72-60-00, para 4.B.
- Inspect magnetic chip detectors per Para 4.B.

↓

Are size and number of chips acceptable?

- No → **Replace engine** IAW (Similar to TM 55-1520-248-23, Task 4-1-2)
- Yes ↓

- Service and reinstall magnetic chip detectors IAW TMI-2840-263-23, 72-60-00, para 4.B.
- Remove combustion module IAW TMI-2840-263-23, 72-40-00, para 4.A. and 2.A.
- Inspect for evidence of debris passage from compressor into combustion section and turbine.

↓

Evidence of debris passage noted?

- No → R-30 5A (Pg 7)
- Yes → **Replace engine** IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

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R-30. Excessive Vibration

R-30
5A

- Inspect outer combustion case and combustion liner IAW TMI-2840-263-23, 72-40-00, para 1.C. and 2.B. respectively.
- If required, make repairs to outer combustion case IAW TMI-2840-263-23, 72-40-00, para 2.B., (or replace).
- If required, make repairs to combustion liner IAW TMI-2840-263-23, 72-40-00, para 1.C. (or replace).

- Remove and replace
  Turbine module
  IAW TMI-2840-263-23, 72-50-00, para 1.A. and 1.B.
- Reinstall combustion module IAW TMI-2840-263-23, 72-40-00, para 1.B. 2.A.
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

Return to service

R-30
BB

Remove and
Replace engine
IAW (Similar to TM 55-1520-248-23, Tasks 4-1-1 and 4-1-2).

R-30
CC

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1.)
- Remove bottom and side magnetic chip detectors IAW TMI-2840-263-23, 72-60-00, para 4.B.
- Inspect magnetic chip detectors per Para 4.B.

Are size and number of chips acceptable?

Yes

No

Replace engine
IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

- Service and reinstall magnetic chip detectors IAW TMI-2840-263-23, 72-60-00, para 4.B.
- If required, make repairs to outer combustion case IAW TMI-2840-263-23, 72-40-00, para 2.B. (or replace).
- If required, make repairs to combustion liner IAW TMI-2840-263-23, 72-40-00, para 1.C. (or replace).

- Remove and replace
  Turbine module
  IAW TMI-2840-263-23, 72-50-00, para 1.A. and 1.B.
- Reinstall combustion module IAW TMI-2840-263-23, 72-50-00, para 1.B. and 2.A.
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

Return to service

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SD-1. Afterfire (Rising MGT After Shutdown)

Shutdown afterfires, which are indicated by rising MGT after cessation of Ng rotation, are usually the result of fuel leaking past the HMU cut-off valve, or of internal oil leakage in the turbine section of the engine.

If an afterfire is encountered, use the following sequence to isolate and correct the fault.

Afterfires can cause damage to the gas generator turbine that could result in failure. Follow the sequence as specified.

- After the fire is extinguished and MGT has cooled below 150°C (302°F) -- **[do not motor engine to cool]** -- disconnect the fuel nozzle hose at the fuel nozzle end.
- Move the twist grip to cut-off position and observe whether the HMU throttle lever is hard against the minimum (0°) stop. **If not against the stop, do not adjust or rerig at this time.**
- Open the aircraft fuel shut-off valve.
- Direct the end of the fuel nozzle hose into a container. and motor the engine with the starter.
- With the twist grip in the cut-off position, observe whether fuel flows from the fuel nozzle hose during motoring.

Did fuel flow from fuel nozzle hose?

No → SD-1 A (Pg 1)

Yes ↓

Was HMU throttle lever hard against min. stop?

No → (Inspect throttle linkage)

Yes ↓

Remove and **Replace HMU** IAW TMI-2840-263-23, 73-21-01, para 1.A. and 1.B.

This includes checking rigging per Para 1.D., and purging per Para 1.B.

Perform a check run to verify proper operation.

Return to service

- Inspect throttle linkage, from twist grip to HMU input spindle, for security and freedom from slack or looseness.
- Verify rigging IAW TMI-2840-263-23, 73-21-01, para 1.D.
- Make corrections as required IAW (Similar to TM 55-1520-248-23, Tasks 4-6-1 through 4-6-8, as applicable).

Purge fuel system IAW TMI-2840-263-23, 73-21-01, para 1.B.and verify that fuel flow stops when twist grip is returned to cut-off prior to termination of motoring.

Perform a check run and shutdown to verify freedom from afterfire.

Return to service

SD-1 A

- Reconnect and secure fuel nozzle hose to fuel nozzle.
- Remove burner drain valve and inspect for proper function, IAW TMI-2840-263-23, 72-40-00, para 3.A. and 3.D.

Was burner drain valve stuck in closed position?

No → SD-1 C (Pg 2)

Yes ↓

Service burner drain valve per Para 3.C. **(or replace)**, and reinstall per Para 3.B.

SD-1 B (Pg 2)

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SD-1. Afterfire (Rising MGT After Shutdown)

SD-1
B

Perform a check run and shutdown to verify freedom from afterfire.

Return to service

SD-1
C

Perform troubleshooting sequence of Procedure SD-3 (Smoking During Shutdown).

Return to service

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SD-2. Compressor Bearing Noise Or Loose Compressor Rotor

Compressor noise during coastdown, sometimes accompanied by radial looseness of the impeller and evidence of vane tip rub, are indications of compressor bearing failure.

If an unusual noise was heard from the vicinity of the compressor during coastdown, and bearing failure is suspected, proceed as follows:

- Remove bottom and side magnetic chip detectors IAW TMI-2840-263-23, 72-60-00, para 4.B.
- Inspect magnetic chip detectors per Para 4.B.

Are size and number of chips acceptable?

No → **Replace engine** IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

Yes →

- Service and reinstall magnetic chip detectors IAW TMI-2840-263-23, 72-60-00, para 4.B.
- Remove the air induction cowl IAW (Similar to TM 55-1520-248-23, Task 4-2-1).
- Inspect compressor inlet for indications of impeller vane tip rub or looseness in front (No. 1) bearing area.

Impeller vane tip rub or rotor looseness noted?

No →

- Reinstall the air induction cowl IAW (Similar to TM 55-1520-248-23, Task 4-2-3)
- Perform an engine check run at 100% Np, with rotor at flat pitch, of sufficient duration to reach stabilized oil temperature.
- Shut down after a two minute cooldown at ground idle.
- Listen for compressor bearing noise during coastdown.

Does bearing noise persist?

No → **Return to service**

Yes (from either decision) →

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove and replace.
  Compressor module
  IAW TMI-2840-263-23, 72-30-00, para 1.A. and 1.B. (This also requires removal and reinstallation of turbine module IAW TMI-2840-263-23, 72-50-00, para 1.A. and 1.B.)
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

Service engine oil system IAW TMI-2840-263-23, 72-00-00, para 8.A.m Lubrication System Servicing. This includes the following:

- Drain oil tank (Similar to TM 55-1520-248-23,Task 1-4-5).
- Inspect oil tank for carbon, sludge, and deposits (Similar to TM 55-1520-248-23, Task 4-4-2).
- Remove, inspect, service, reinstall engine oil filter element (TMI-2840-263-23, 72-60-00, para 1.C.).
- Clean oil filter housing assembly (TMI-2840-263-23, 72-60-00, para 1.C. and 1.D.).
- Remove, inspect, service, and reinstall side and bottom chip detectors (TMI-2840-263-23, 72-60-00, para 4.B).
- Flush No. 1 bearing scavenge oil line.
- If contaminants noted in oil, remove, clean, and reinstall oil pressure reducer (TMI-2840-263-23, 72-00-00, para 8.A., Lubrication System Servicing), and flush aircraft oil lines and oil cooler.
- Remove and replace scavenge oil filter element IAW (Similar to TM 55-1520-248-23, Task 4-4-17).
- Service engine oil system IAW (Similar to TM 55-1520-248-23, Task 1-4-5.1).

SD-2 A (Pg 2)

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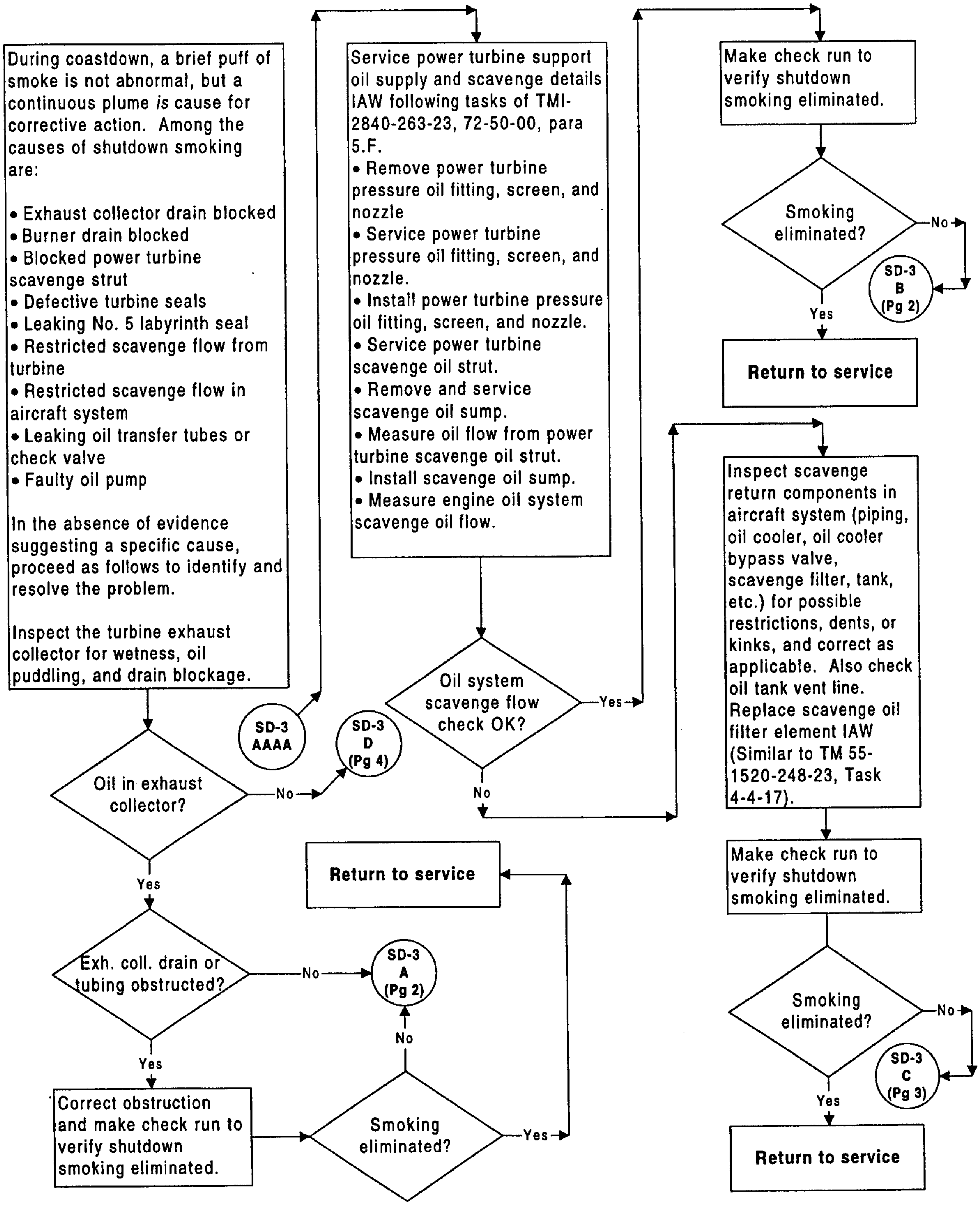
SD-2
A

As a part of the check runs accompanying engine installation Task 4-1-2, check diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, 72-00-00, para 1.B., Diffuser Vent Orifice Selection.

Return to service

SD-3. Smoking During Shutdown



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SD-3. Smoking During Shutdown

SD-3 A

Visually determine whether oil is in the form of a puddle from exhaust collector hub fairing (No. 5 labyrinth seal), or wetness from the compressor rear seal vent (forward left side of exh. coll.) or accessory gearbox breather vent (forward right side of exh. coll.).

Puddling from No. 5 labyrinth seal?

Yes

No

Wetness from compressor seal vent?

Yes

No

This leaves only the accessory gearbox breather vent as the source of oil wetting.

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove compressor module IAW TMI-2840-263-23, 72-30-00, para 1.A. (This also requires removal of turbine module IAW TMI-2840-263-23, 72-30-00, para 1.B.)
- Remove and replace **Breather gearshaft lip seal** per TMI-2840-263-23, 72-60-00, para 1.B.
- Reinstall compressor and turbine modules per TMI-2840-263-23, 72-30-00, para 1.B. and 72-50-00, para 1.B.
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

To assure necessary pressurization for No. 5 labyrinth seal, verify that compressor seal vent orifice is properly seated. If not seated, seat it.

Was seal seated?

Yes

No

Make engine run to measure and adjust diffuser vent pressure. Use a 0-30 in. Hg pressure gage attached to the fitting provided on the compressor-to-turbine vent tube. Verify pressure is at least 0.8 in. Hg at idle and not greater than 10.0 in. Hg at takeoff power. If pressure is outside these limits, remove and replace orifice with another size, IAW TMI-2840-263-23, 72-00-00, para 1.B., Diffuser Vent Orifice Selection.

Return to service

Make check run to verify shutdown smoking eliminated.

SD-3 B

- Remove engine IAW (Similar to TM55-1520-248-23, Task 4-1-1).
- Remove and replace **Turbine module** IAW TMI-2840-263-23,72-50-00, para 1.A. and 1.B.).
- Install combustion module IAW TMI-2840-263-23, 72-40-00, para 1.B.
- Reinstall engine IAW (Similar to TM55-1520-248-23, Task 4-1-2).

Return to service

No

Smoking eliminated?

Yes

Return to service

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SD-3. Smoking During Shutdown

SD-3 C

- Remove oil filter housing and check valve IAW TMI-2840-263-23, 72-60-00, para 1.D.
- Remove transfer tubes and inspect O-rings on both ends, as well as check valve O-rings.
- Inspect O-ring lands on transfer tubes and check valve for wear.
- Inspect bores in filter housing body and accessory gearbox housing (where transfer tubes and check valve are inserted) for wear.

- If O-ring land wear is noted on oil transfer tubes, replace **Oil transfer tubes**
- If O-ring land wear is noted on oil check valve, replace **Oil check valve**
- If transfer tube bore wear is noted in oil filter housing, replace **Oil filter housing**

Transfer tube bore wear in gearbox housing?

No

Yes

Were O-rings OK, all other related parts OK?

Yes

No

Reinstall oil filter housing, transfer tubes, and check valve IAW TMI-2840-263-23,72-60-00,para 1.D., using all new O-rings and gasket.

- Make check run to verify shutdown smoking eliminated.
- If oil filter housing was replaced, measure and adjust main oil pressure IAW TMI-2840-263-23, 72-00-00, para 8.A., Lubrication System Servicing and 72-60-00, para 3.A.

Return to service

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove and replace **Accessory gearbox module** IAW TMI-2840-263-23, 72-60-00, para 1.A., respectively. (This requires removal and reinstallation of compressor and turbine modules IAW TMI-2840-263-23, 72-30-00, para 1.A., 1.B. and 72-50-00, para 1.A., 1.B.)
- Reinstall engine IAW TM 55-1520-248-23, Task 4-1-2.*

Measure and adjust main oil pressure IAW TMI-2840-263-23, 72-00-00, para 8.A., Lubrication System and 72-60-00, para 3.A.

Return to service

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SD-3. Smoking During Shutdown

SD-3 D

- Remove burner drain valve IAW TMI-2840-263-23, 72-40-00, para 3.A.
- Service valve IAW TMI-2840-263-23, 72-40-00, para 3.C. and 3.D. If satisfactory after servicing, reinstall per Para 3.B. Otherwise replace.

Is oil present at burner drain?

No → SD-3 AAAA (Pg 1)

Yes ↓

Replace external check valve in turbine pressure oil supply line on right side of engine just below horizontal heat shield, with direction-of-flow arrow pointed aft.

- Remove oil filter housing, two oil transfer tubes, and internal check valve IAW TMI-2840-263-23, 72-60-00, para 2.D.
- Inspect O-ring lands on transfer tubes for wear.
- Inspect bores in filter housing body and accessory gearbox housing (where transfer tubes and check valve are inserted) for wear.
- **Replace check valve**

Transfer tube or check valve bore wear in gearbox housing?

No ↓

- If O-ring land wear is noted on oil transfer tubes, replace **Oil transfer tubes**
- If transfer tube bore wear is noted in oil filter housing, replace **Oil filter housing**

Reinstall oil filter housing, transfer tubes, and new check valve IAW TMI-2840-263-23, 72-60-00, para 2.F., using all new O-rings and gasket.

Yes →

- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove and replace **Accessory gearbox module** IAW TMI-2840-263-23, 72-60-00, para 1.A. and 1.B., respectively. (This requires removal and reinstallation of compressor and turbine modules IAW 72-30-00, para 1.A., 1.B., and 72-50-00, para 1.A., 1.B.)
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

- Make check run to verify shutdown smoking eliminated.
- If accessory gearbox or oil filter housing was replaced, measure and adjust main oil pressure IAW TMI-2840-263-23, 72-00-00, para 8.A. Lubrication System Servicing and 72-60-00, para 3.A.

Smoking eliminated?

Yes ↓

Return to service

No →

Oil running from burner drain valve?

Yes → SD-3 CCCC (Pg 5)

No ↓

- Remove engine IAW (Similar to TM55-1520-248-23, Task 4-1-1).
- Remove and replace **Turbine module** IAW TMI-2840-263-23, 72-50-00, para 1.A. and 1.B.).
- Install combustion module IAW TMI-2840-263-23, 72-40-00, para 1.b. and 2.A.
- Reinstall engine IAW (Similar to TM55-1520-248-23, Task 4-1-2).

SD-3 BBBB (Pg 5)

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SD-3. Smoking During Shutdown

SD-3 BBBB

Make check run to verify shutdown smoking eliminated.

Return to service

SD-3 CCCC

Service power turbine support oil supply and scavenge details IAW following tasks of TMI-2840-263-23, 72-50-00, para 5.F.
- Remove power turbine pressure oil fitting, screen, and nozzle.
- Service power turbine pressure oil fitting, screen, and nozzle.
- Install power turbine pressure oil fitting, screen, and nozzle.
- Service power turbine scavenge oil strut.
- Remove and service scavenge oil sump.
- Measure oil flow from power turbine scavenge oil strut.
- Install scavenge oil sump.
- Measure engine oil system scavenge oil flow.

Scavenge oil flow check OK?

Yes →
- Remove engine IAW TM55-1520-248-23, Task 4-1-1.*
- Remove and replace **Turbine module** IAW TM55-2840-256-23, Tasks 5-1-2* and 5-1-3*).
- Install combustion module IAW TM55-2840-256-23, Task 4-1-5.
- Reinstall engine IAW TM55-1520-248-23, Task 4-1-2.

Make check run to verify shutdown smoking eliminated.

Return to service

No →

Inspect scavenge return components in aircraft system (piping, oil cooler, oil cooler bypass valve, scavenge filter, tank, etc.) for possible restrictions, dents, or kinks, and correct as applicable. Also check oil tank vent line. Replace scavenge oil filter element IAW (Similar to TM 55-1520-248-23, Task 4-4-17).

Make check run to verify shutdown smoking eliminated.

Smoking eliminated?

Yes → **Return to service**

No →

Was accessory gearbox replaced earlier in sequence?

Yes → **Replace engine** IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

No →
- Remove engine IAW (Similar to TM 55-1520-248-23, Task 4-1-1).
- Remove and replace **Accessory gearbox module** IAW TMI-2840-263-23, 72-60-00, para 1.A., respectively. (This requires removal and reinstallation of compressor and turbine modules IAW 72-30-00, para 1.A., 1.B. adn 72-50-00, para 1.A., 1.B.)
- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

SD-3 5A (Pg 6)

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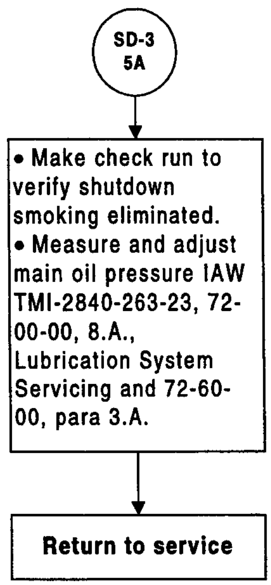
SD-3. Smoking During Shutdown



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SD-4. Unable To Stop Engine With Twist Grip

Inability to stop the engine by rotating the twist grip to the cut-off position indicates that the positive fuel cut-off valve in the HMU is not closing.
If this occurs, the engine must be stopped by moving the aircraft manual fuel valve to the OFF position.
The usual cause of failure to stop is mechanical slack or binding in the aircraft linkage between the twist grip and the HMU, or misrigging of the HMU throttle lever to the aircraft linkage. The possibility also exists that the fault could be in the HMU.
If the engine cannot be shut down by normal means, proceed as follows:

Check the position of the throttle lever on the HMU with the twist grip in cut-off, to verify that it is against the minimum (0°) mechanical stop.

Is HMU throttle lever hard against min stop?

No →

- Inspect throttle linkage, from twist grip to HMU input spindle, for security and freedom from slack or looseness.
- Verify rigging IAW TMI-2840-263-23, 73-21-01, para 1.D.
- Make corrections as required IAW (Similar to TM 55-1520-248-23, Tasks 4-6-1 through 4-6-8, as applicable).

Purge fuel system IAW TMI-2840-263-23, 73-21-01, para 1.B. and, prior to termination of motoring, verify that fuel flow stops when twist grip is returned to cut-off position.

Perform a check run to confirm proper cut-off operation.

Return to service

Yes →

Remove and **Replace HMU** IAW TMI-2840-263-23, 73-21-01, para 1.A. and 1.B.
This includes checking rigging per Para 1.D., and purging per Para 1.B.

Perform a check run to verify proper cut-off operation.

Return to service

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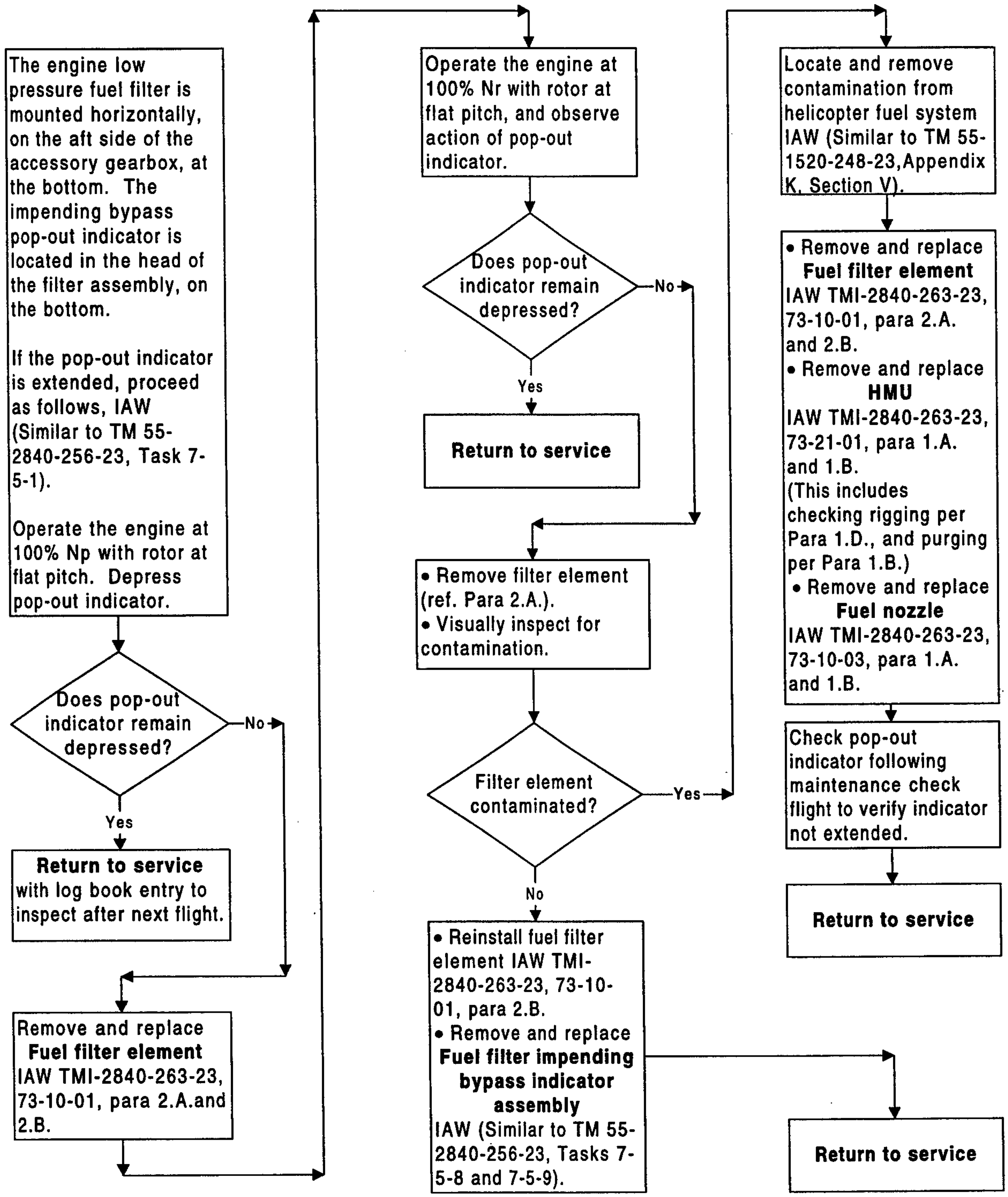
Off-1. Filter (Engine Fuel) Impending Bypass Indicator Extended



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Off-2. Filter (Main Oil) Impending Bypass Indicator Extended

The impending bypass pop-out indicator for the engine main oil filter is located in the oil filter cap, atop the accessory gearbox.

If the pop-out indicator is extended, proceed as follows, IAW TMI-2840-263-23, 72-60-00, para 1.C.

Operate engine at 100% Np, with rotor at flat pitch, until oil reaches stabilized operating temperature.

Press pop-out indicator in and operate engine throughout range from ground idle to light-on-skids power.

Does pop-out indicator remain depressed?

Yes → **Return to service**

No →

- Remove, inspect, service, and reinstall oil filter element, IAW TMI-2840-263-23, 72-60-00, para 1.C.
- Warm engine at 100% Np, with rotor at flat pitch, until oil reaches stabilized operating temperature.
- Press pop-out indicator in.
- Operate engine throughout range from ground idle to light-on-skids power.

Does pop-out indicator remain depressed?

Yes → **Return to service**

No →

Remove oil filter element (Para 1.C.) and reinspect for indications of oil contamination

Contamination noted?

No →

- Remove and replace **Oil filter impending bypass indicator** IAW TMI-2840-263-23, 72-60-00, para 1.D.
- Reinstall oil filter element (ref. Task 6-2-13).
- Warm engine at 100% Np, with rotor at flat pitch, until oil reaches stabilized operating temperature.
- Press pop-out indicator in.
- Operate engine throughout range from ground idle to light-on-skids power.

→ **Return to service**

Yes →

Service engine oil system IAW TMI-2840-263-23, 72-00-00, para 1.D. This includes the following:

- Drain oil tank (Similar to TM 55-1520-248-23, Task 1-4-5).
- Inspect oil tank for carbon, sludge, and deposits (Similar to TM 55-1520-248-23, Task 4-4-2).
- Remove, inspect, service, reinstall engine oil filter element (TMI-2840-263-23, 72-60-00, para 1.C.).
- Clean oil filter housing assembly (TMI-2840-263-23, 72-60-00, para 1.C.).
- Remove, inspect, service, and reinstall side and bottom chip detectors (TMI-2840-263-23, 72-60-00, para 4.B.).
- If contaminants noted in oil, remove, clean, and reinstall oil pressure reducer (TMI-2840-263-23, 72-00-00, para 8.A., Lubrication System Servicing), and flush aircraft oil lines, oil cooler, and oil cooler bypass valve.
- Remove and replace scavenge oil filter element IAW (Similar to TM 55-1520-248-23, Task 4-4-17).
- Service engine oil system IAW (Similar to TM 55-1520-248-23, Task 1-4-5.1).

↓

- Warm engine at 100% Np, with rotor at flat pitch, until oil reaches stabilized operating temperature.
- Press pop-out indicator in.
- Operate engine throughout range from ground idle to light-on-skids power.
- Verify pop-out indicator remains depressed.

→ **Return to service**

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Off-3. Oil Tank Level Lowering With Engine Inoperative

When the oil tank level drops with the engine inoperative, it is usually because of leakage from the tank back to the accessory gearbox through:

- A faulty internal check valve
- Oil transfer tube(s)
- Oil pump flange(s).

Also, inadequate oil scavenging during engine coastdown can result in oil retention in the accessory gearbox at shutdown, which produces a similar effect.

If lowering of the oil tank level with the engine inoperative is observed, proceed as follows to resolve the problem.

- Check oil level to confirm level in tank has lowered since engine shutdown.
- Motor engine with starter for 30 seconds and check oil level immediately after coastdown.

Is proper oil tank level restored?

Yes → **Return to service**

No →

- Start engine and operate at ground idle until oil temperature stabilizes.
- Shut down and check oil level immediately after Ng rotation ceases.

Is proper oil tank level restored?

Yes → **Return to service**

No →

- Remove bottom magnetic chip detector IAW TMI-2840-263-23, 72-60-00, para 4.b.
- Capture oil draining from chip detector port and measure quantity.

Is amount drained less than 900 cc?

Yes →

- Reinstall bottom chip detector per Task 6-3-6.
- Service (top off) oil tank IAW (Similar to TM 55-1520-248, Task 1-4-5.1).

Return to service

No →

- Disconnect engine Oil In and Oil Out lines at accessory gearbox, and plug and cap exposed lines and fittings.
- Remove oil filter element IAW TMI-2840-263-23, 72-60-00, para 1.C.
- Fill oil filter cavity with engine oil.
- Check level of oil in filter cavity after 30-60 minutes.

Has oil level in filter cavity dropped?

No → Off-3 B (Pg 2)

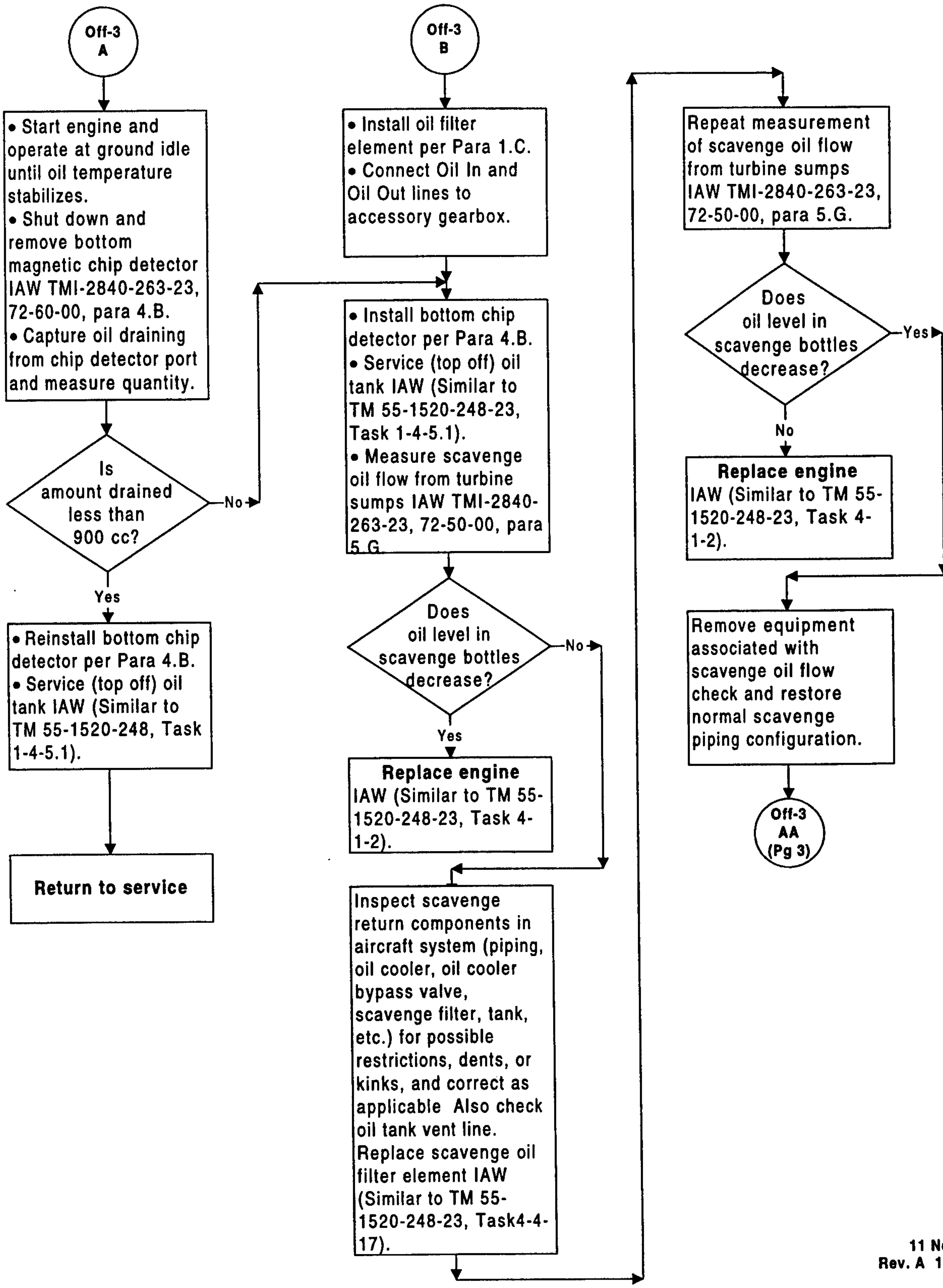
Yes →

- Remove oil filter housing IAW TMI-2840-263-23, 72-60-00, para 1.d.
- Remove and replace **Oil check valve** and reinstall oil filter housing, per Para 1.D., being sure to replace O-rings on check valve and oil transfer tubes, and gasket on oil filter housing.
- Install oil filter element per Para 1.C.
- Connect Oil In and Oil Out lines to accessory gearbox.
- Install bottom chip detector per Para 4.B.
- Service (top off) oil tank IAW (Similar to TM 55-1520-248-23, Task 1-4-5.1).

Off-3 A (Pg 2)

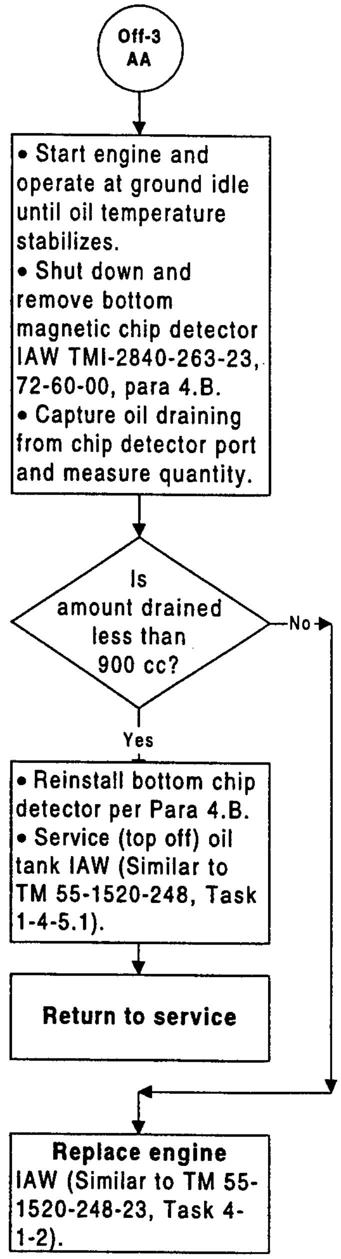
11 Nov 1997
Rev. A 17 Mar 1998

Off-3. Oil Tank Level Lowering With Engine Inoperative



11 Nov 1997
Rev. A 17 Mar 1998

Off-3. Oil Tank Level Lowering With Engine Inoperative



11 Nov 1997
Rev. A 17 Mar 1998

Off-4. Oil Runs From Burner Drain Valve After Shutdown

Oil, leaking past a faulty external check valve in the turbine pressure oil supply system during shutdown, can flood and overflow the turbine bearing cavities. The oil can then drain by gravity into the outer combustion case and out the burner drain for a period of time after coastdown (until the bearing cavities have drained themselves dry).
A similar condition can occur with a faulty lube system internal check valve, in which case seepage into the hot section and out the burner drain can occur on a continuous basis during the post shutdown period.

If oil leakage from the burner drain valve after shutdown is encountered, resolve the problem in accordance with the following procedure.

Start engine and run at ground idle until oil temperature stabilizes. Shut down and remove burner drain valve (IAW TMI-2840-263-23, 72-40-00, para 3.A.) just as soon as the engine rotor rotation ceases. Place a container under the burner drain boss to collect oil leaking therefrom. Measure and record the amount of leakage after one hour and after two hours.

Did most of leakage occur during 1st hour?

No → (go to: Remove oil filter housing...)

Yes ↓

Remove and replace **External check valve** in turbine pressure oil supply line on right side of engine just below horizontal heat shield, with direction-of-flow arrow pointed aft.

- Reinstall burner drain valve IAW TMI-2840-263-23, 72-40-00, para 3.B.
- Start engine and run at ground idle until oil temperature stabilizes.
- Shut down and remove burner drain valve (IAW TMI-2840-263-23, 72-40-00, para 3.A.) just as soon as the engine rotor rotation ceases.
- Observe for oil leakage from the burner drain port.

Oil leakage observed?

Yes → (go to: Remove oil filter housing...)

No ↓

Reinstall burner drain valve IAW TMI-2840-263-23, 72-40-00, para 3.B.

Return to service

- Remove oil filter housing IAW TMI-2840-263-23, 72-60-00, para 1.D.
- Remove and replace **Internal check valve** and reinstall oil filter housing, per Para 1.D., being sure to replace O-rings on check valve and oil transfer tubes, and gasket on oil filter housing.

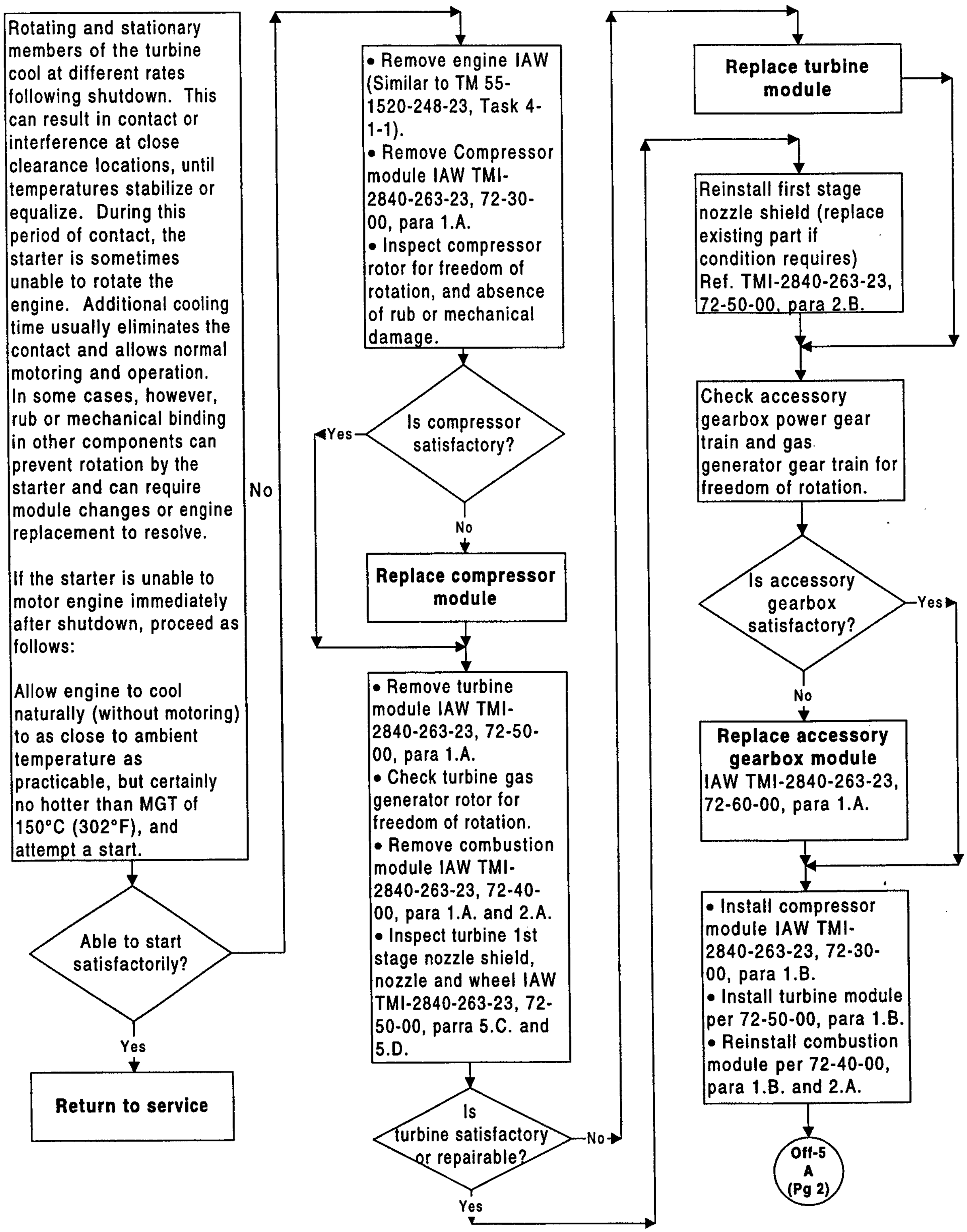
- Reinstall burner drain valve IAW TMI-2840-263-23, 72-40-00, para 3.B.
- Start engine and run at ground idle until oil temperature stabilizes.
- Shut down and remove burner drain valve (IAW TMI-2840-263-23, 72-40-00, para 3.A.) just as soon as the engine rotor rotation ceases.
- Verify no oil leakage from the burner drain port.

Reinstall burner drain valve IAW TMI-2840-263-23, 72-40-00, para 3.B.

Return to service

12 Nov 1997
Rev. A 17 Mar 1998

Off-5. Starter Will Not Rotate Engine Immediately After Shutdown



12 Nov 1997
Rev. A 17 Mar 1998

Off-5. Starter Will Not Rotate Engine Immediately After Shutdown

Off-5 A

↓

- Reinstall engine IAW (Similar to TM 55-1520-248-23, Task 4-1-2).

↓

Perform check run to verify proper engine function and demonstrate satisfactory starting.

↓

Return to service

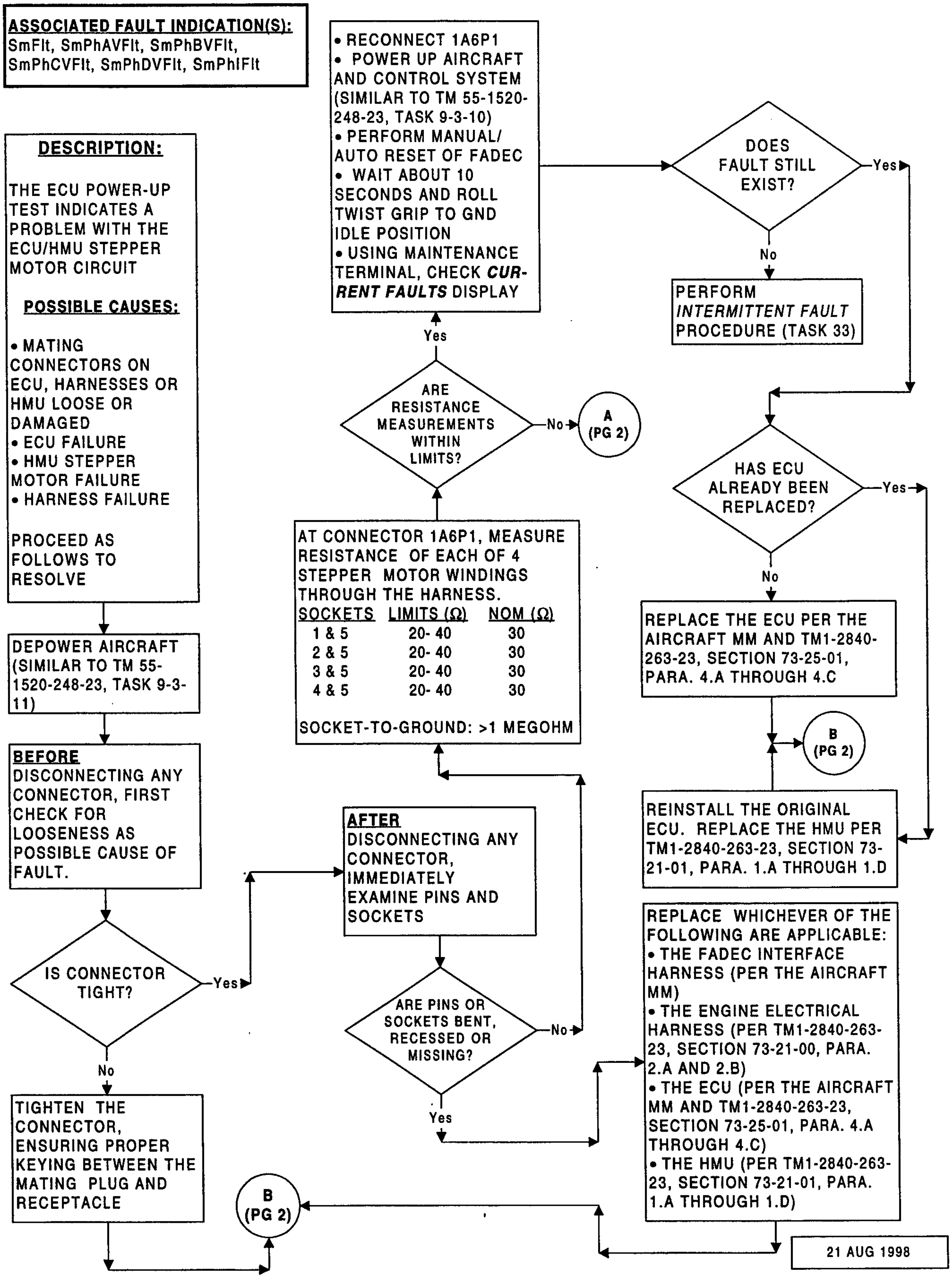
12 Nov 1997
Rev. A 17 Mar 1998

Appendix C

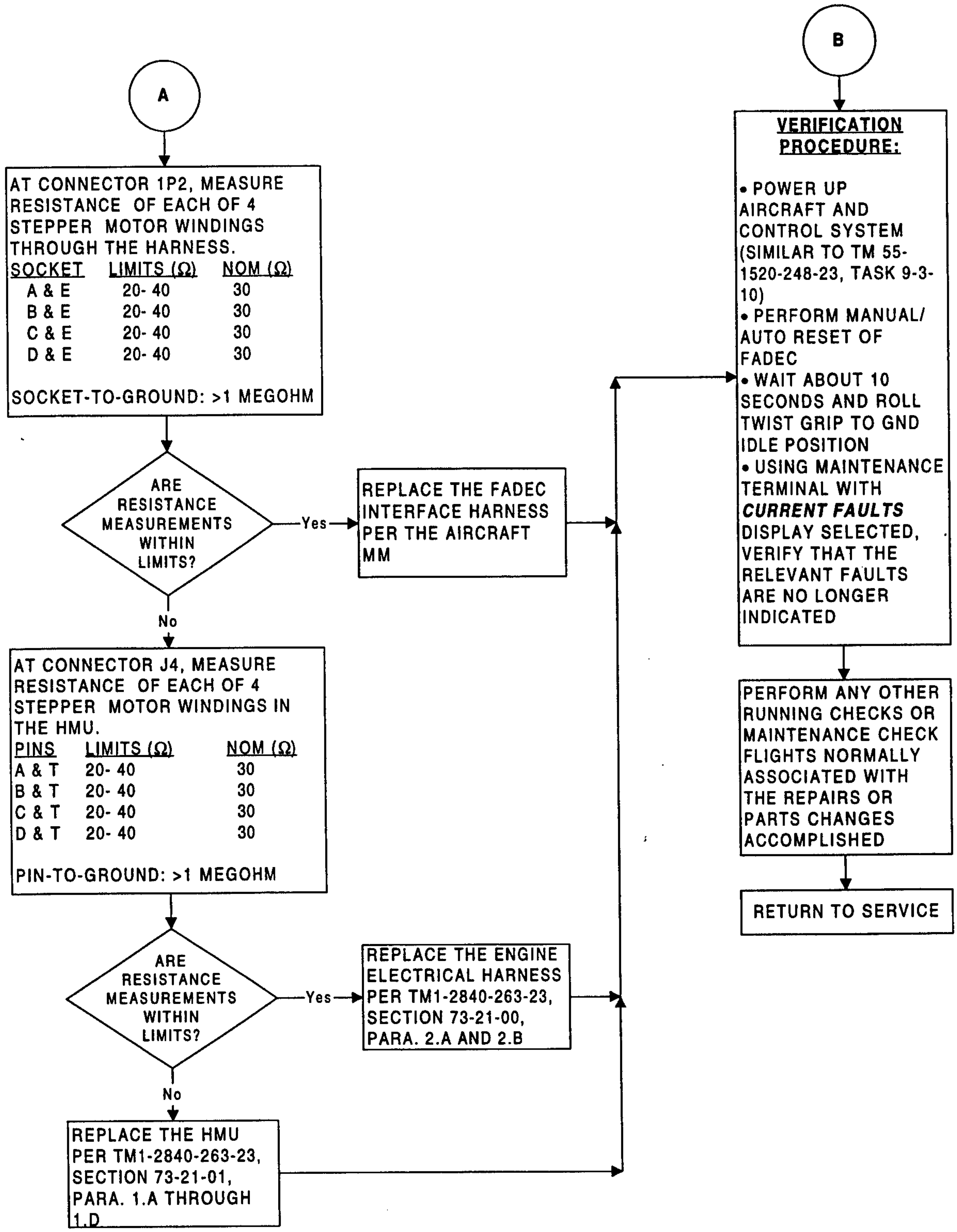
Model 250-C30R/3 FADEC Fault Isolation and Correction Visio Charts

57 Procedures (112 pages)

1. STEPPER MOTOR CIRCUIT FAULT

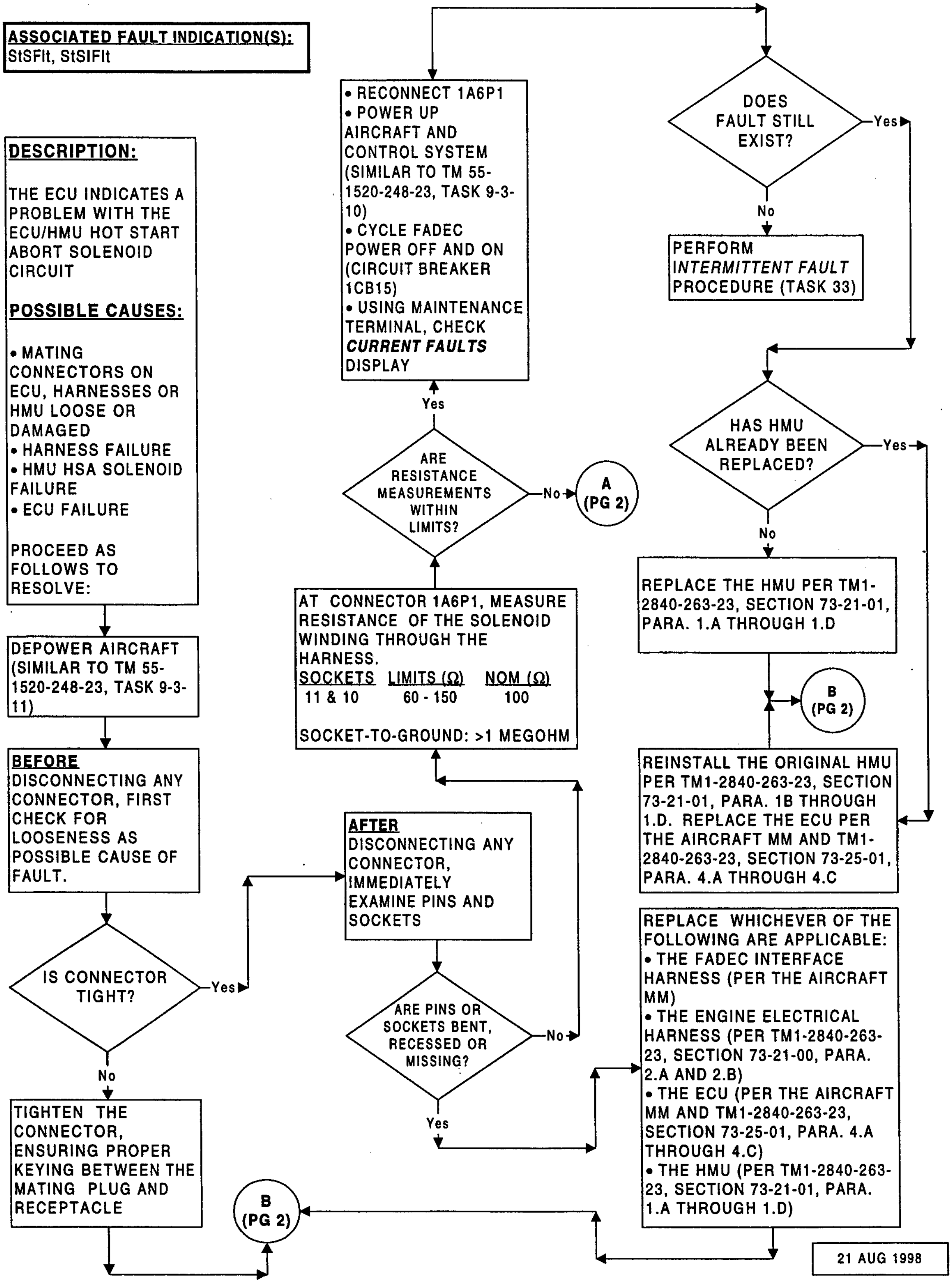


1. STEPPER MOTOR CIRCUIT FAULT



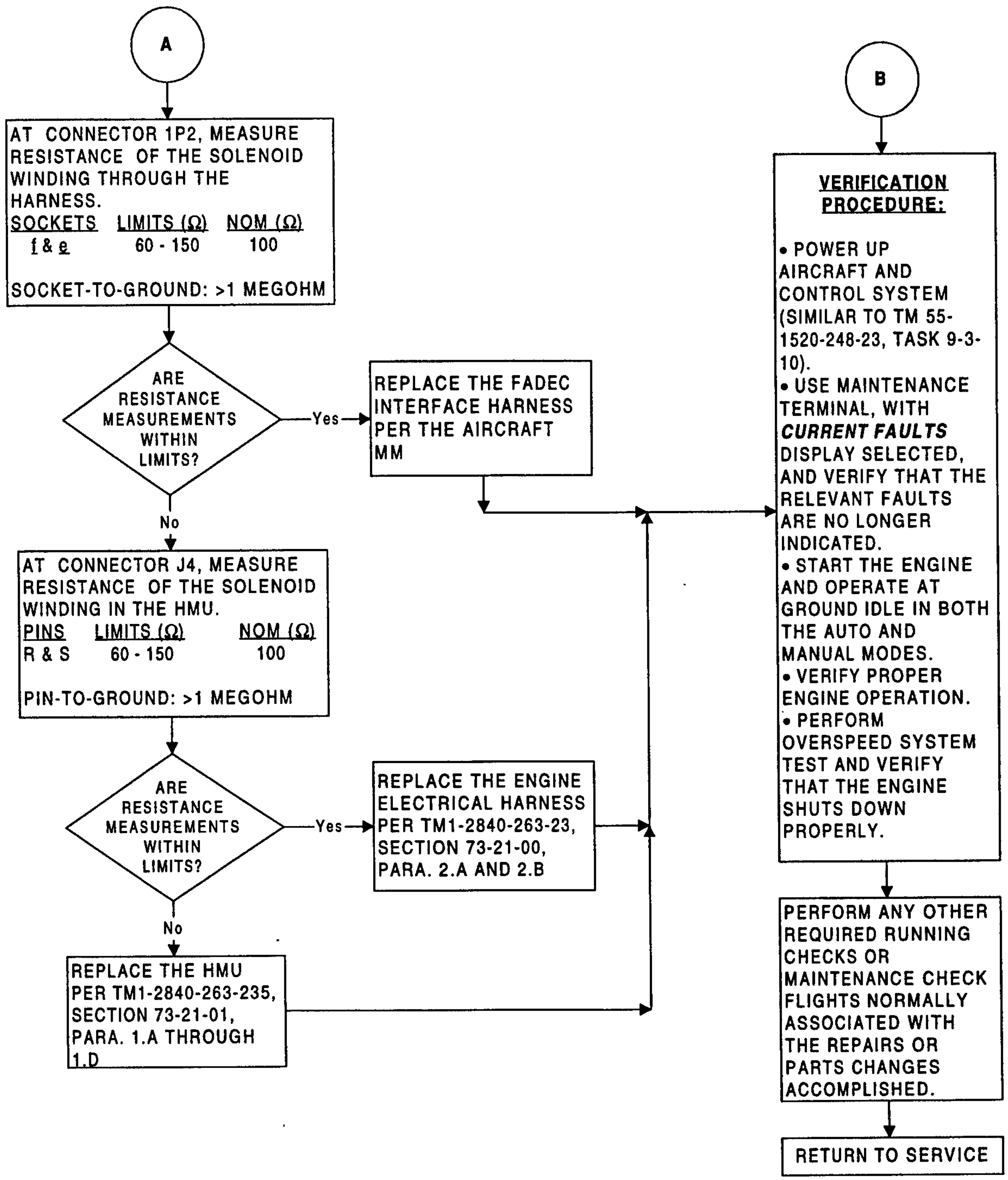
21 AUG 1998

2. HOT START ABORT SOLENOID CIRCUIT FAULT



21 AUG 1998

2. HOT START ABORT SOLENOID CIRCUIT FAULT



21 AUG 1998

3. AUTO/MANUAL CHANGEOVER SOLENOID CIRCUIT FAULT

ASSOCIATED FAULT INDICATION(S):
AMIFlt, AMSolFlt

DESCRIPTION:

THE ECU INDICATES A PROBLEM WITH THE ECU/ HMU AUTO/MANUAL CHANGEOVER SOLENOID CIRCUIT

POSSIBLE CAUSES:

- MATING CONNECTORS ON ECU, HARNESSES OR HMU LOOSE OR DAMAGED
- HARNESS FAILURE
- HMU AUTO/MANUAL CHANGEOVER SOLENOID FAILURE
- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT?

No: TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE → B (PG 2)

Yes: **AFTER** DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING?

Yes: REPLACE WHICHEVER OF THE FOLLOWING ARE APPLICABLE:
- THE FADEC INTERFACE HARNESS (PER THE AIRCRAFT MM)
- THE ENGINE ELECTRICAL HARNESS (PER TM1-2840-263-23, SECTION 73-21-00, PARA. 2.A AND 2.B)
- THE ECU (PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)
- THE HMU (PER TM1-2840-263-23, SECTION 73-21-01, PARA. 1.A THROUGH 1.D)

→ B (PG 2)

No: AT CONNECTOR 1A6P1, MEASURE RESISTANCE OF THE SOLENOID WINDING THROUGH THE HARNESS.

SOCKETS	LIMITS (Ω)	NOM (Ω)
6 & 7	9 -19	13

SOCKET-TO-GROUND: >1 MEGOHM

ARE RESISTANCE MEASUREMENTS WITHIN LIMITS?

No → A (PG 2)

Yes:
- RECONNECT 1A6P1
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- USING MAINTENANCE TERMINAL, CHECK ***CURRENT FAULTS*** DISPLAY WHILE SELECTING MANUAL MODE THEN AUTO MODE TWO TIMES

DOES FAULT STILL EXIST?

No: PERFORM *INTERMITTENT FAULT* PROCEDURE (TASK 33)

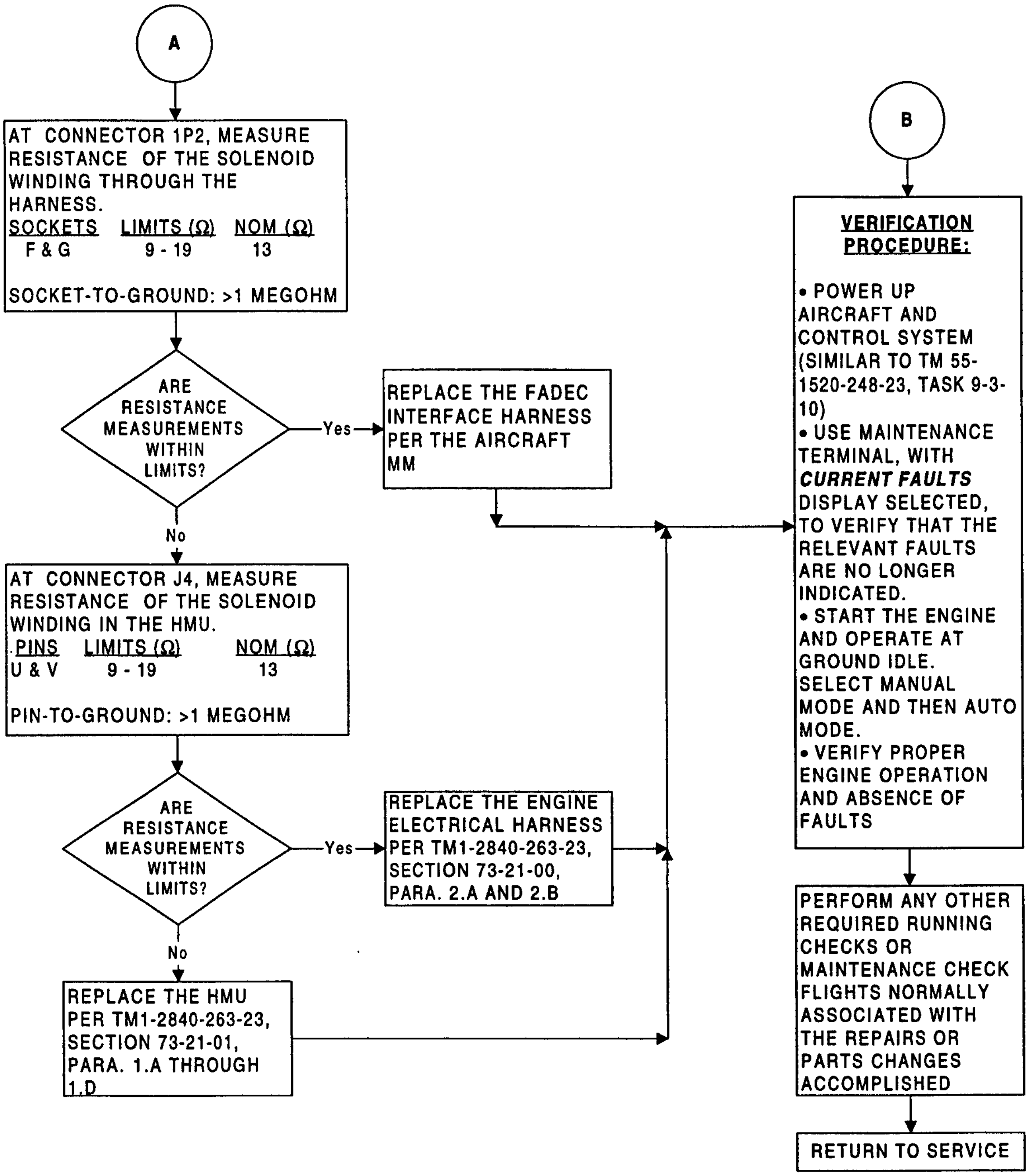
Yes: HAS ECU ALREADY BEEN REPLACED?

No: REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C → B (PG 2)

Yes: REINSTALL THE ORIGINAL ECU. REPLACE THE HMU PER TM1-2840-263-23, SECTION 73-21-01, PARA. 1.A THROUGH 1.D → B (PG 2)

21 AUG 1998

3. AUTO/MANUAL CHANGEOVER SOLENOID CIRCUIT FAULT



21 AUG 1998

4. OVERSPEED SYSTEM POWER-UP SELF TEST FAULT

ASSOCIATED FAULT INDICATION(S):
OSI12Flt, OSTst1Flt, OSTst2Flt, OSTst3Flt, OSTst4Flt, OSTst5Flt, OSTst6Flt, OSTst7Flt,

DESCRIPTION:

THE ECU INDICATES A PROBLEM WITH THE ECU/ HMU OVERSPEED SHUT-OFF SOLENOID CIRCUIT DURING POWER-UP

POSSIBLE CAUSES:

- MATING CONNECTORS ON ECU, HARNESSES OR HMU LOOSE OR DAMAGED
- HARNESS FAILURE
- HMU OVERSPEED SHUT-OFF SOLENOID FAILURE
- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT? — Yes / No

No: TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE

B (PG 2)

Yes: **AFTER** DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING? — Yes / No

No: AT CONNECTOR 1A6P1, MEASURE RESISTANCE OF THE SOLENOID WINDING THROUGH THE HARNESS.

SOCKETS	LIMITS (Ω)	NOM (Ω)
35 & 45	21 - 45	30
46 & 34	21 - 45	30

SOCKET-TO-GROUND: >1 MEGOHM

ARE RESISTANCE MEASUREMENTS WITHIN LIMITS? — Yes / No

No: A (PG 2)

Yes:
- RECONNECT 1A6P1
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- USING MAINTENANCE TERMINAL, CHECK ***CURRENT FAULTS*** DISPLAY AFTER CYCLING FADEC POWER OFF AND ON (FADEC CIRCUIT BREAKER 1CB15)

DOES FAULT STILL EXIST? — Yes / No

No: PERFORM *INTERMITTENT FAULT* PROCEDURE (TASK 33)

Yes: HAS ECU ALREADY BEEN REPLACED? — Yes / No

No: REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C

B (PG 2)

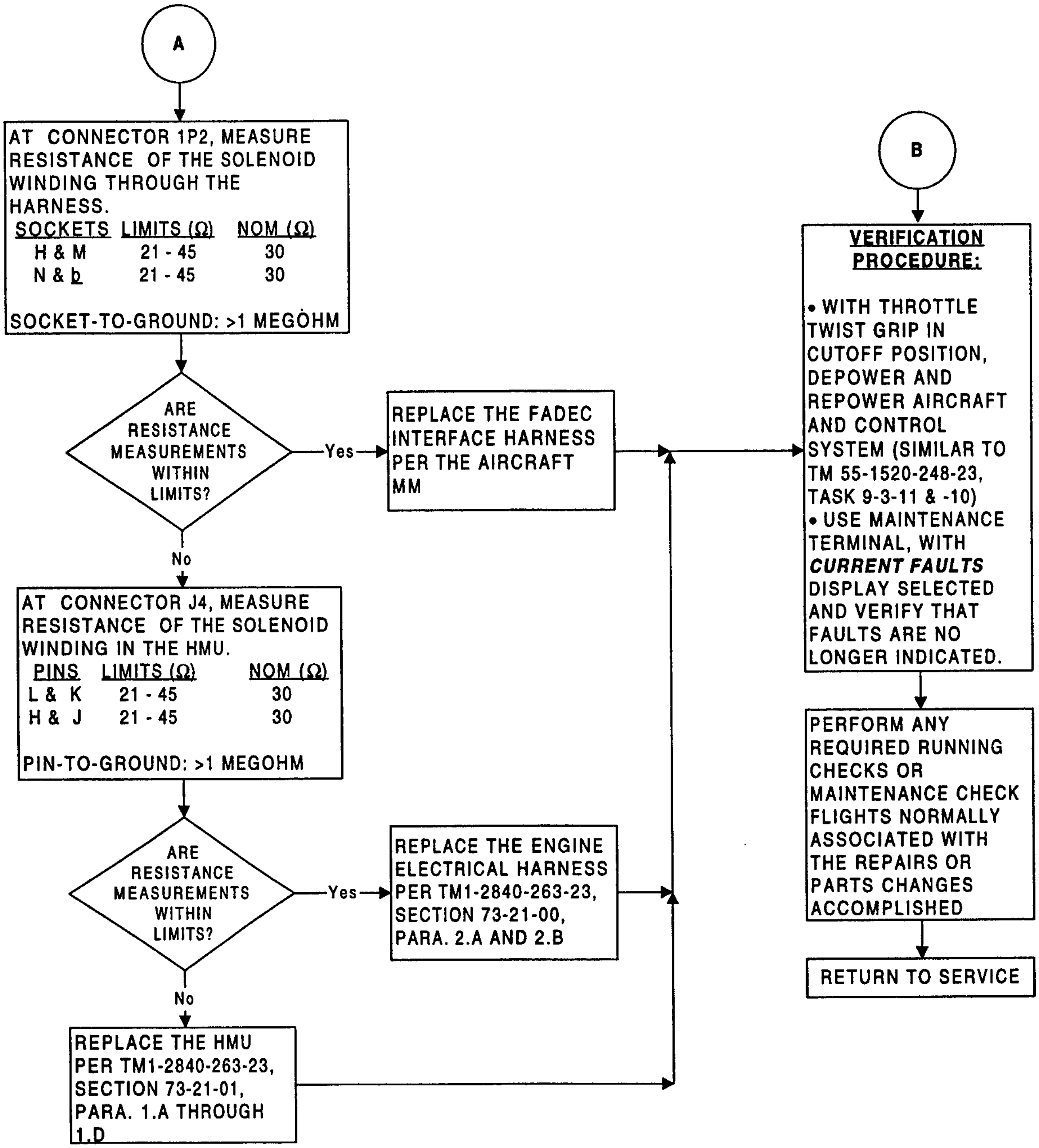
Yes: REINSTALL THE ORIGINAL ECU. REPLACE THE HMU PER TM1-2840-263-23, SECTION 73-21-01, PARA. 1.A THROUGH 1.D

Yes (pins or sockets bent, recessed or missing): REPLACE WHICHEVER OF THE FOLLOWING ARE APPLICABLE:
- THE FADEC INTERFACE HARNESS (PER THE AIRCRAFT MM)
- THE ENGINE ELECTRICAL HARNESS (PER TM1-2840-263-23, SECTION 73-21-00, PARA. 2.A AND 2.B)
- THE ECU (PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)
- THE HMU (PER TM1-2840-263-23, SECTION 73-21-01, PARA. 1.A THROUGH 1.D)

B (PG 2)

21 AUG 1998

4. OVERSPEED SYSTEM POWER-UP SELF TEST FAULT



21 AUG 1998

5. METERING VALVE POSITION POTENTIOMETER CIRCUIT FAULT

ASSOCIATED FAULT INDICATION(S):
WfmvFlt, WfmvRgFlt, WfmvRtFlt

DESCRIPTION:

THE ECU INDICATES A PROBLEM WITH THE ECU/ HMU METERING VALVE POSITION POTENTIOMETER CIRCUIT

POSSIBLE CAUSES:

- MATING CONNECTORS ON ECU, HARNESSES OR HMU LOOSE OR DAMAGED
- HARNESS FAILURE
- HMU METERING VALVE POSITION POTENTIOMETER FAILURE
- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT?

No → TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE → B (PG 2)

Yes → **AFTER** DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING?

Yes → REPLACE WHICHEVER OF THE FOLLOWING ARE APPLICABLE:
- THE FADEC INTERFACE HARNESS (PER THE AIRCRAFT MM)
- THE ENGINE ELECTRICAL HARNESS (PER TM1-2840-263-23, SECTION 73-21-00, PARA. 2.A AND 2.B)
- THE ECU (PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)
- THE HMU (PER TM1-2840-263-23, SECTION 73-21-01, PARA. 1.A THROUGH 1.D)

→ B (PG 2)

No → AT CONNECTOR 1A6P1, MEASURE RESISTANCE OF THE POTENTIOMETER THROUGH THE HARNESS.

SOCKETS	LIMITS (Ω)	NOM (Ω)
54 & 55	4250-5750	5000
53 & 55	1000-1500	1200
53 & 54	3500-5250	4300

SOCKET-TO-GROUND: >1 MEGOHM

ARE RESISTANCE MEASUREMENTS WITHIN LIMITS?

No → A (PG 2)

Yes → RECONNECT 1A6P1. POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10). USING MAINTENANCE TERMINAL, CHECK ***CURRENT FAULTS*** DISPLAY AFTER CYCLING FADEC POWER OFF AND ON (***FADEC*** CIRCUIT BREAKER 1CB15)

DOES FAULT STILL EXIST?

No → PERFORM *INTERMITTENT FAULT* PROCEDURE (TASK 33)

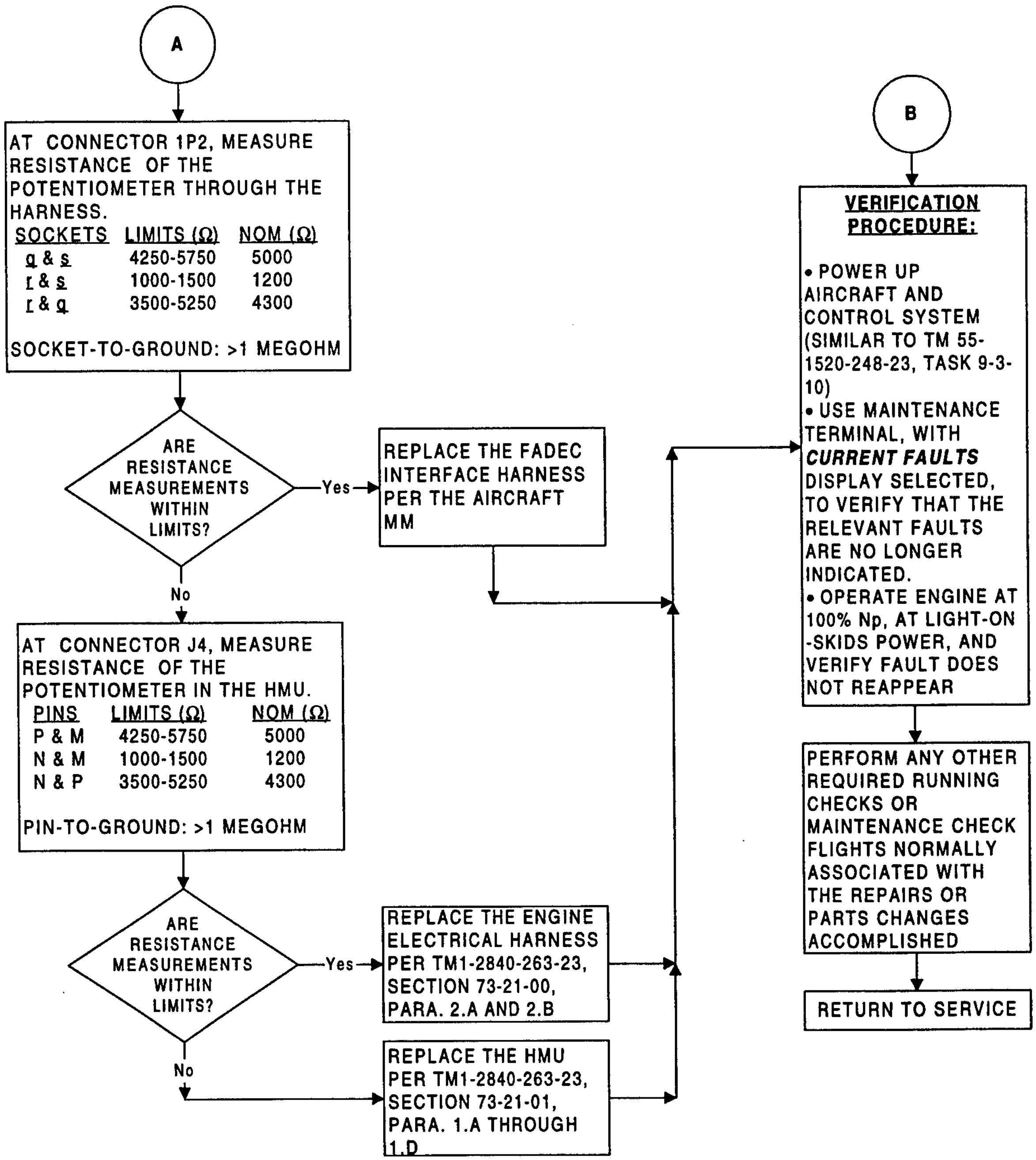
Yes → HAS ECU ALREADY BEEN REPLACED?

No → REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C → B (PG 2)

Yes → REINSTALL THE ORIGINAL ECU. REPLACE THE HMU PER TM1-2840-263-23, SECTION 73-21-01, PARA. 1.A THROUGH 1.D → B (PG 2)

21 AUG 1998

5. METERING VALVE POSITION POTENTIOMETER CIRCUIT FAULT



21 AUG 1998

6. POWER LEVER ANGLE (THROTTLE POSITION) POTENTIOMETER CIRCUIT FAULT

ASSOCIATED FAULT INDICATION(S):
PLA12Flt, PLA1Flt, PLA1RgFlt, PLA2Flt, PLA2RgFlt, PLADFlt, PLAHdFlt, PLARfFlt, PLARfRgFlt

DESCRIPTION:

THE ECU INDICATES A PROBLEM WITH THE ECU/ HMU PLA POSITION POTENTIOMETER CIRCUIT

POSSIBLE CAUSES:

- MATING CONNECTORS ON ECU, HARNESSES OR HMU LOOSE OR DAMAGED
- HARNESS FAILURE
- HMU PLA STOPS POSITIONED INCORRECTLY
- HMU PLA POSITION POTENTIOMETER FAILURE
- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

- DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)
- SET PLA TO GROUND IDLE POSITION (35°)

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT?

No → TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE → C (PG 3)

Yes → **AFTER** DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING?

Yes → REPLACE WHICHEVER OF THE FOLLOWING ARE APPLICABLE:
- THE FADEC INTERFACE HARNESS (PER THE AIRCRAFT MM)
- THE ENGINE ELECTRICAL HARNESS (PER TM1-2840-263-23, SECTION 73-21-00, PARA. 2.A AND 2.B)
- THE ECU (PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)
- THE HMU (PER TM1-2840-263-23, SECTION 73-21-01, PARA. 1.A THROUGH 1.D)

→ C (PG 3)

No → AT CONNECTOR 1A6P1, MEASURE RESISTANCE OF THE POTENTIOMETER THROUGH THE HARNESS.

SOCKETS	LIMITS (Ω)	NOM (Ω)
57 & 58	4250-5750	5000
56 & 58	2700-4300	3400
56 & 57	1300-2500	1800

SOCKETS	LIMITS (Ω)
51 & 52	SOCKETS 57 & 58 ± 15
50 & 52	SOCKETS 56 & 58 ± 15
50 & 51	SOCKETS 56 & 57 ± 15

SOCKET-TO-GROUND: >1 MEGOHM

ARE RESISTANCE MEASUREMENTS WITHIN LIMITS?

No → A (PG 2)

Yes → SET PLA TO CUTOFF POSITION (0°)

AT THE SAME CONNECTOR (1A6P1), MEASURE RESISTANCE OF THE POTENTIOMETER THROUGH THE HARNESS.

SOCKETS	LIMITS (Ω)	NOM (Ω)
57 & 58	4250-5750	5000
56 & 58	4000-5700	4800
56 & 57	300-600	450

SOCKETS	LIMITS (Ω)
51 & 52	SOCKETS 57 & 58 ± 15
50 & 52	SOCKETS 56 & 58 ± 15
50 & 51	SOCKETS 56 & 57 ± 15

SOCKET-TO-GROUND: >1 MEGOHM

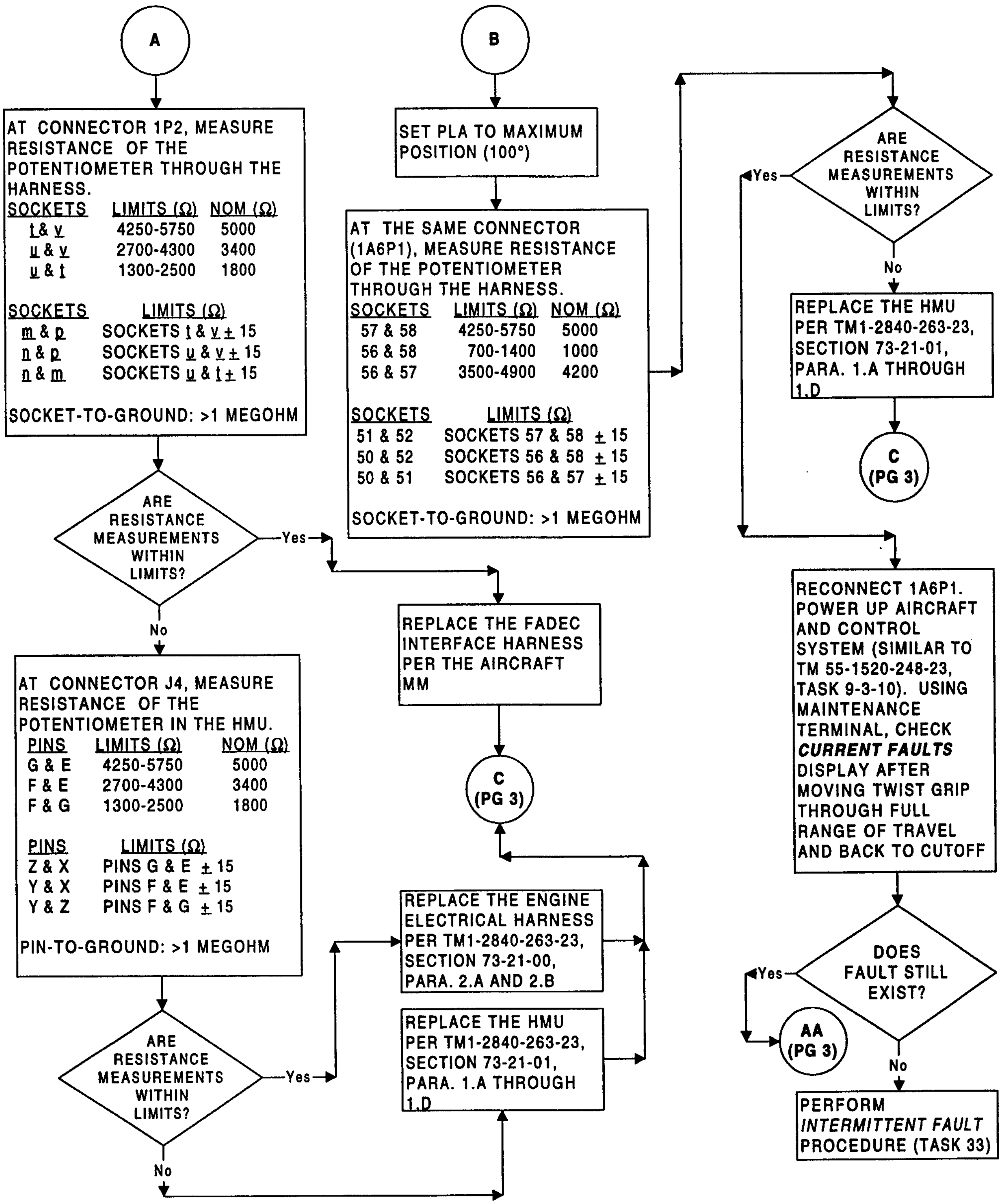
ARE RESISTANCE MEASUREMENTS WITHIN LIMITS?

Yes → B (PG 2)

No → REPLACE THE HMU PER TM1-2840-263-23, SECTION 73-21-01, PARA. 1.A THROUGH 1.D → C (PG 3)

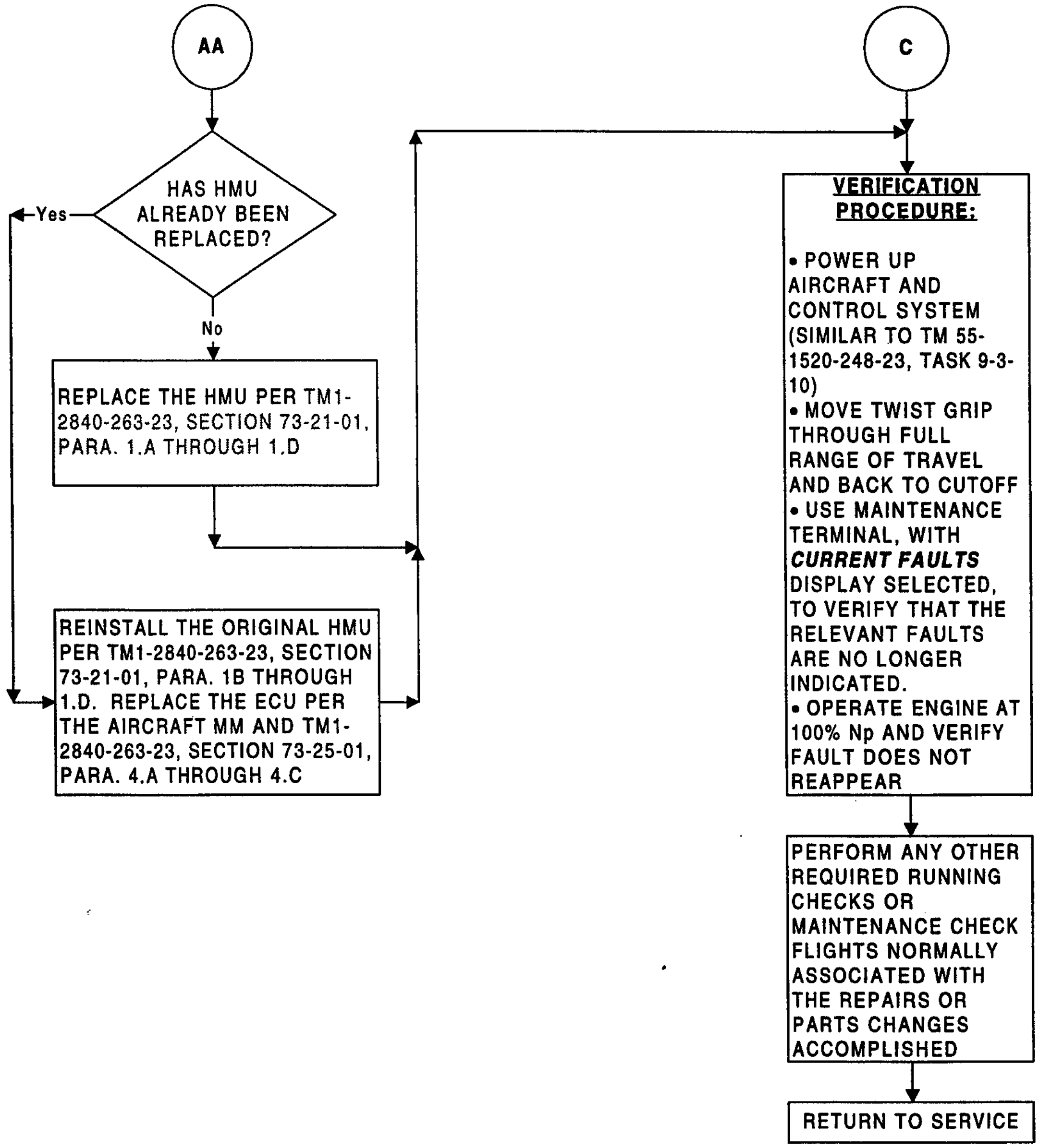
21 AUG 1998

6. POWER LEVER ANGLE (THROTTLE POSITION) POTENTIOMETER CIRCUIT FAULT



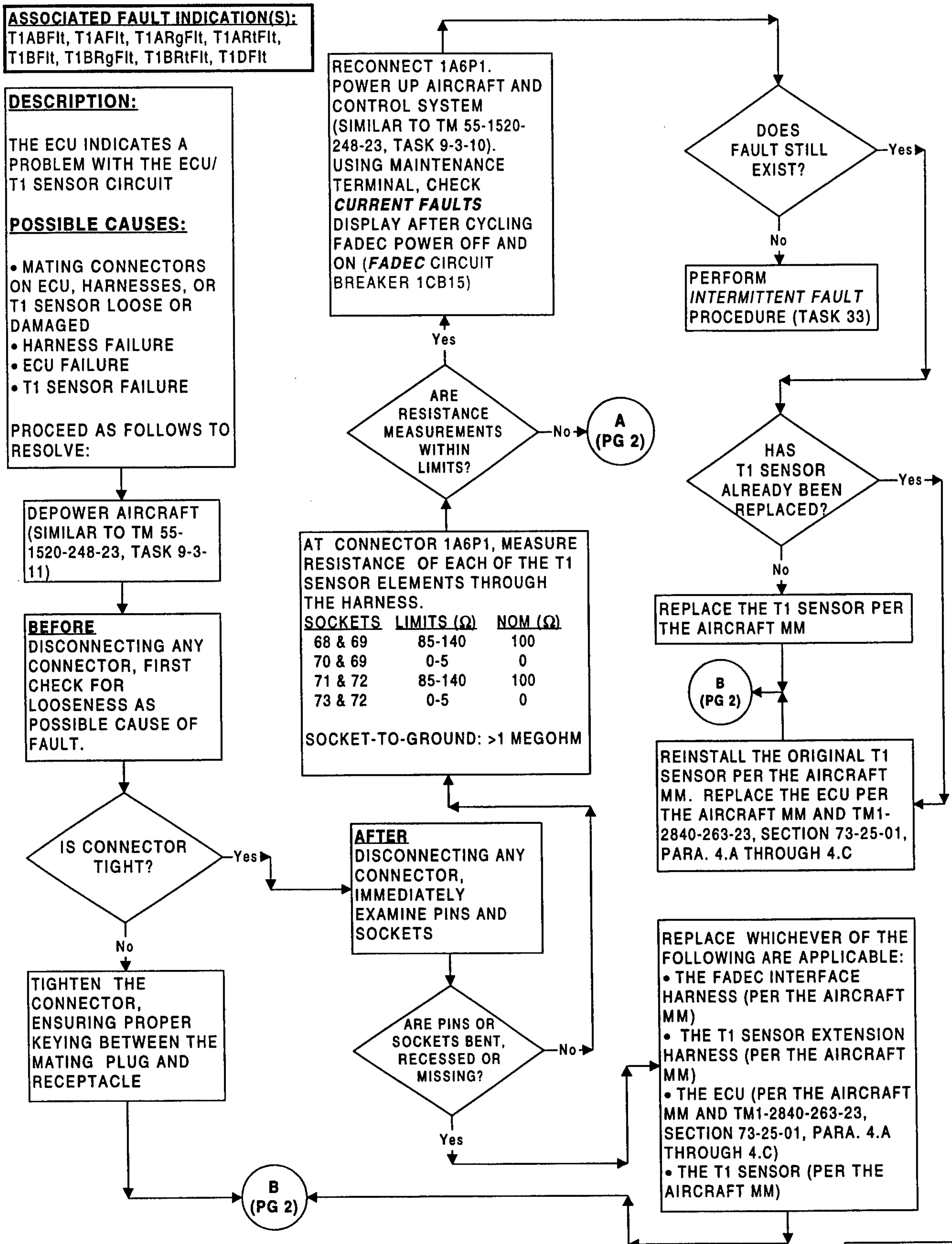
21 AUG 1998

6. POWER LEVER ANGLE (THROTTLE POSITION) POTENTIOMETER CIRCUIT FAULT



21 AUG 1998

7. CIT (T1) TEMPERATURE SENSOR CIRCUIT FAULT



21 AUG 1998

7. CIT (T1) TEMPERATURE SENSOR CIRCUIT FAULT

A

AT CONNECTOR 1P10, MEASURE RESISTANCE OF EACH OF THE T1 SENSOR ELEMENTS THROUGH THE HARNESS.

PINS	LIMITS (Ω)	NOM (Ω)
A & C	85-140	100
B & C	0-5	0
D & F	85-140	100
E & F	0-5	0

PIN-TO-GROUND: >1 MEGOHM

ARE RESISTANCE MEASUREMENTS WITHIN LIMITS?

Yes → REPLACE THE FADEC INTERFACE HARNESS PER THE AIRCRAFT MM

No ↓

AT CONNECTOR 1A8J1, MEASURE RESISTANCE OF EACH OF THE T1 SENSOR ELEMENTS AT THE SENSOR.

PINS	LIMITS (Ω)	NOM (Ω)
A & C	85-140	100
B & C	0-5	0
D & F	85-140	100
E & F	0-5	0

PIN-TO-GROUND: >1 MEGOHM

ARE RESISTANCE MEASUREMENTS WITHIN LIMITS?

Yes → REPLACE THE T1 SENSOR EXTENSION HARNESS PER THE AIRCRAFT MM

No → REPLACE THE T1 SENSOR PER THE AIRCRAFT MM

B

VERIFICATION PROCEDURE:

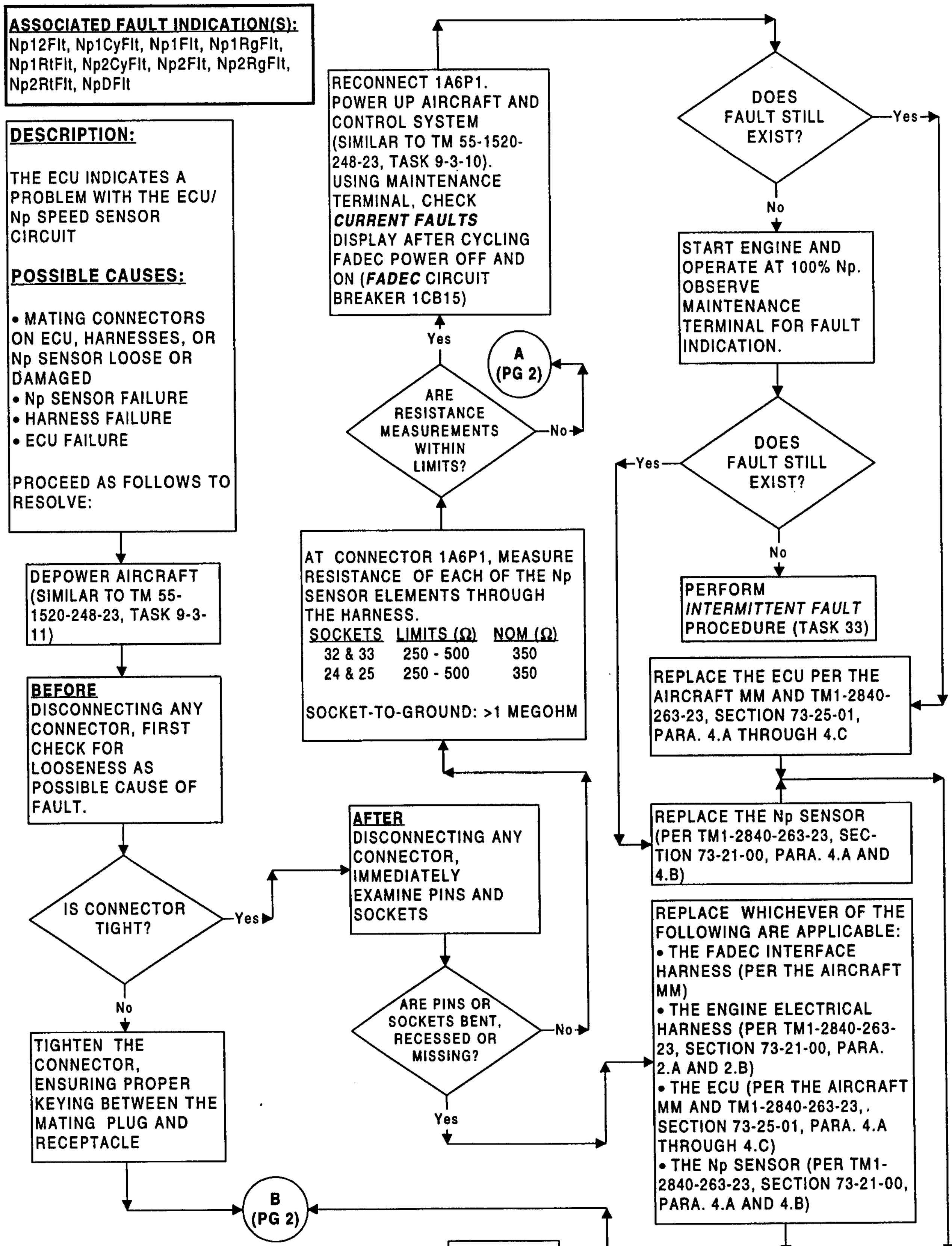
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- USE MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED, TO VERIFY THAT THE RELEVANT FAULTS ARE NO LONGER INDICATED.
- OPERATE ENGINE AT 100% Np AND VERIFY FAULT DOES NOT REAPPEAR

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

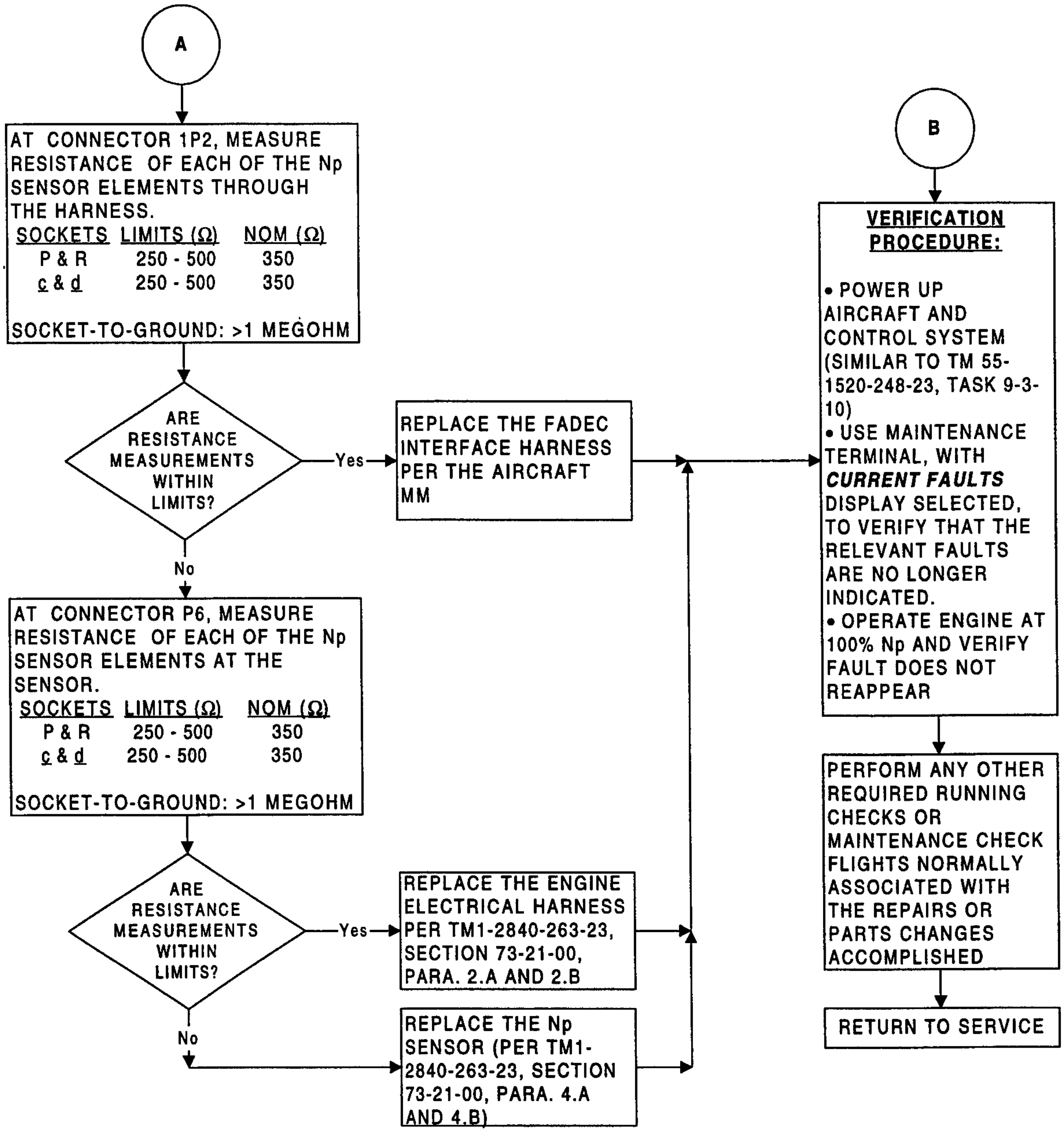
21 AUG 1998

8. N_P (N_2) SPEED SENSOR CIRCUIT FAULT



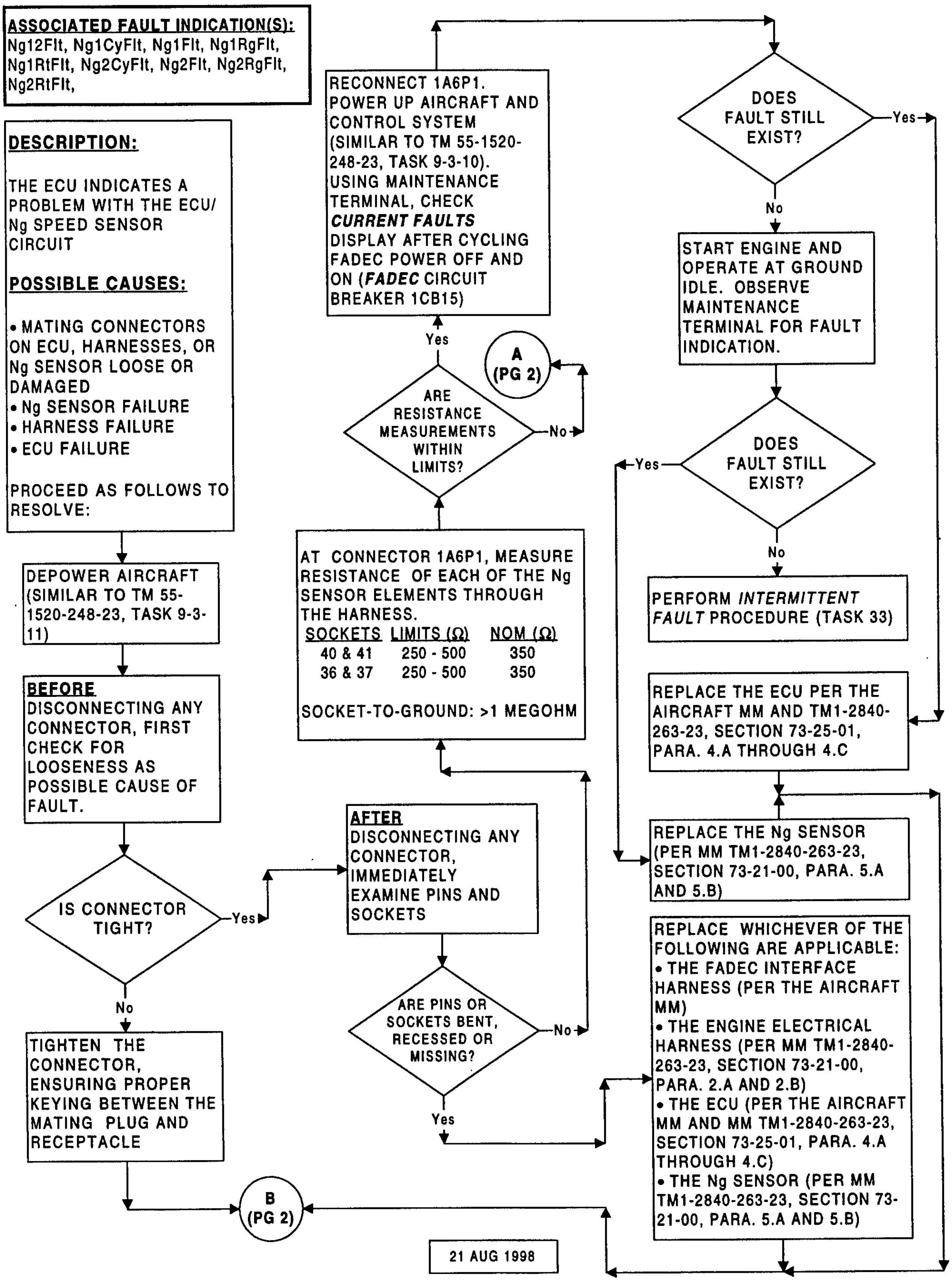
21 AUG 1998

8. N_P (N_2) SPEED SENSOR CIRCUIT FAULT



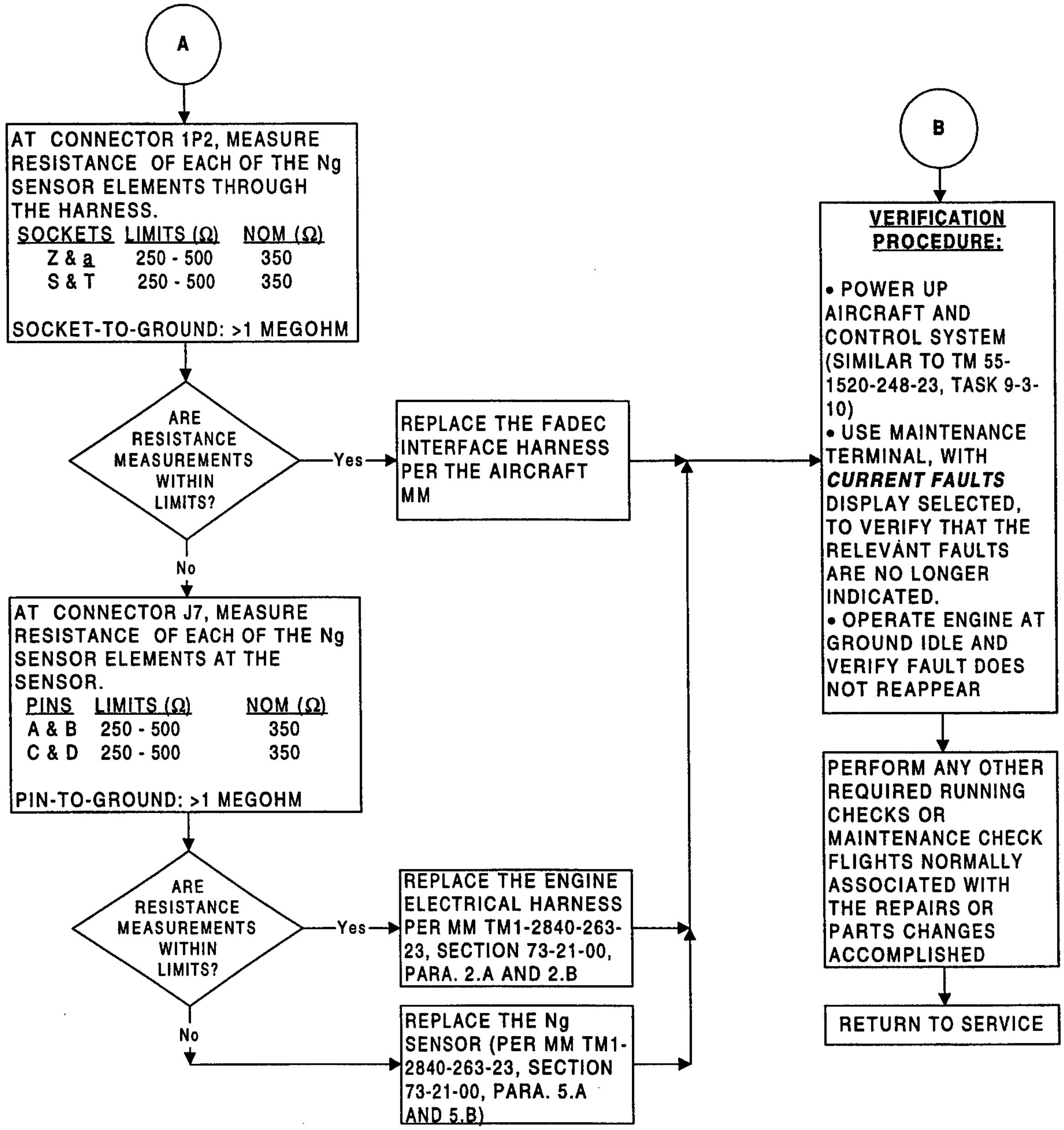
21 AUG 1998

9. N_g (N_1) SPEED SENSOR CIRCUIT FAULT



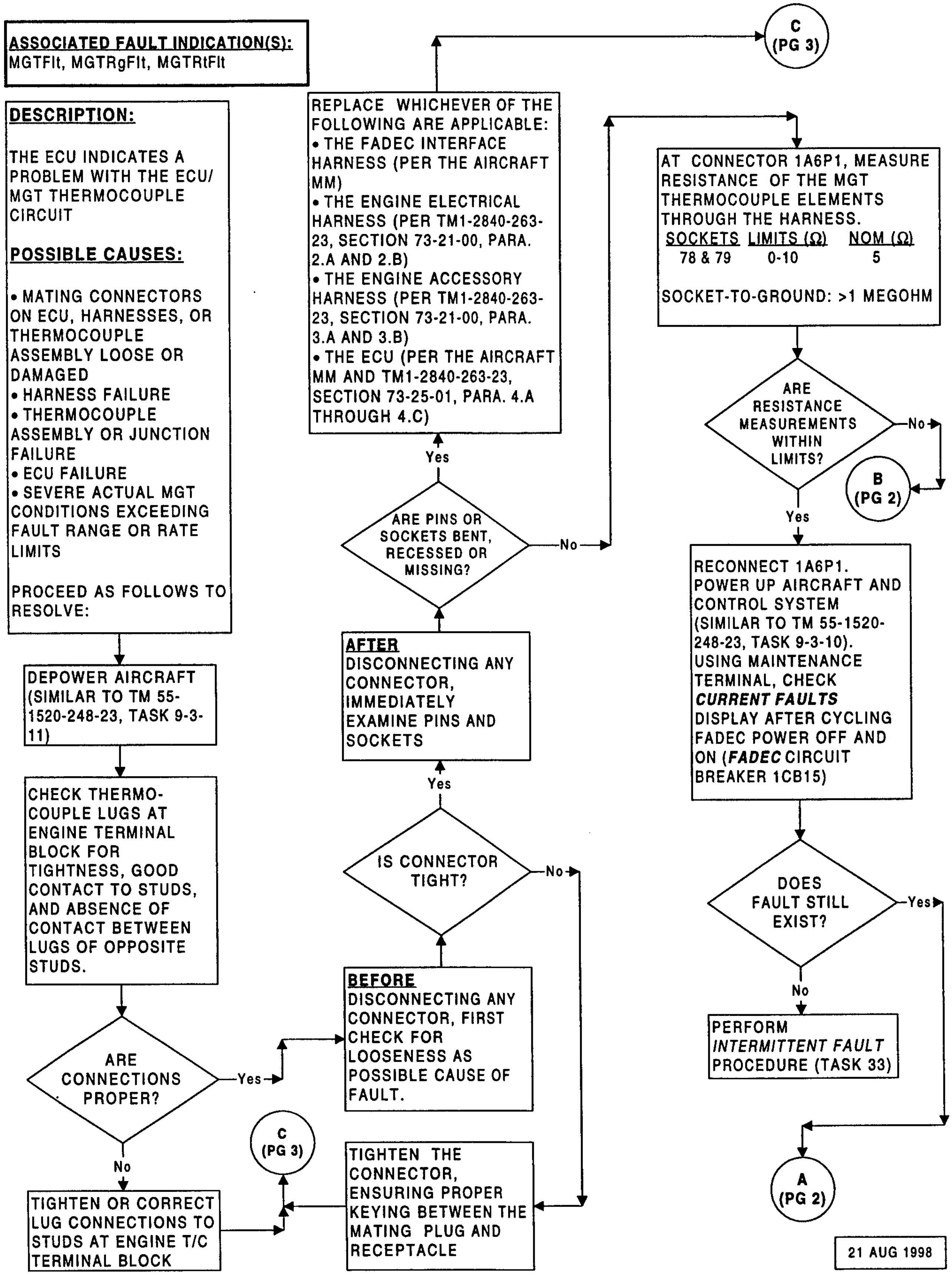
21 AUG 1998

9. N_g (N_1) SPEED SENSOR CIRCUIT FAULT



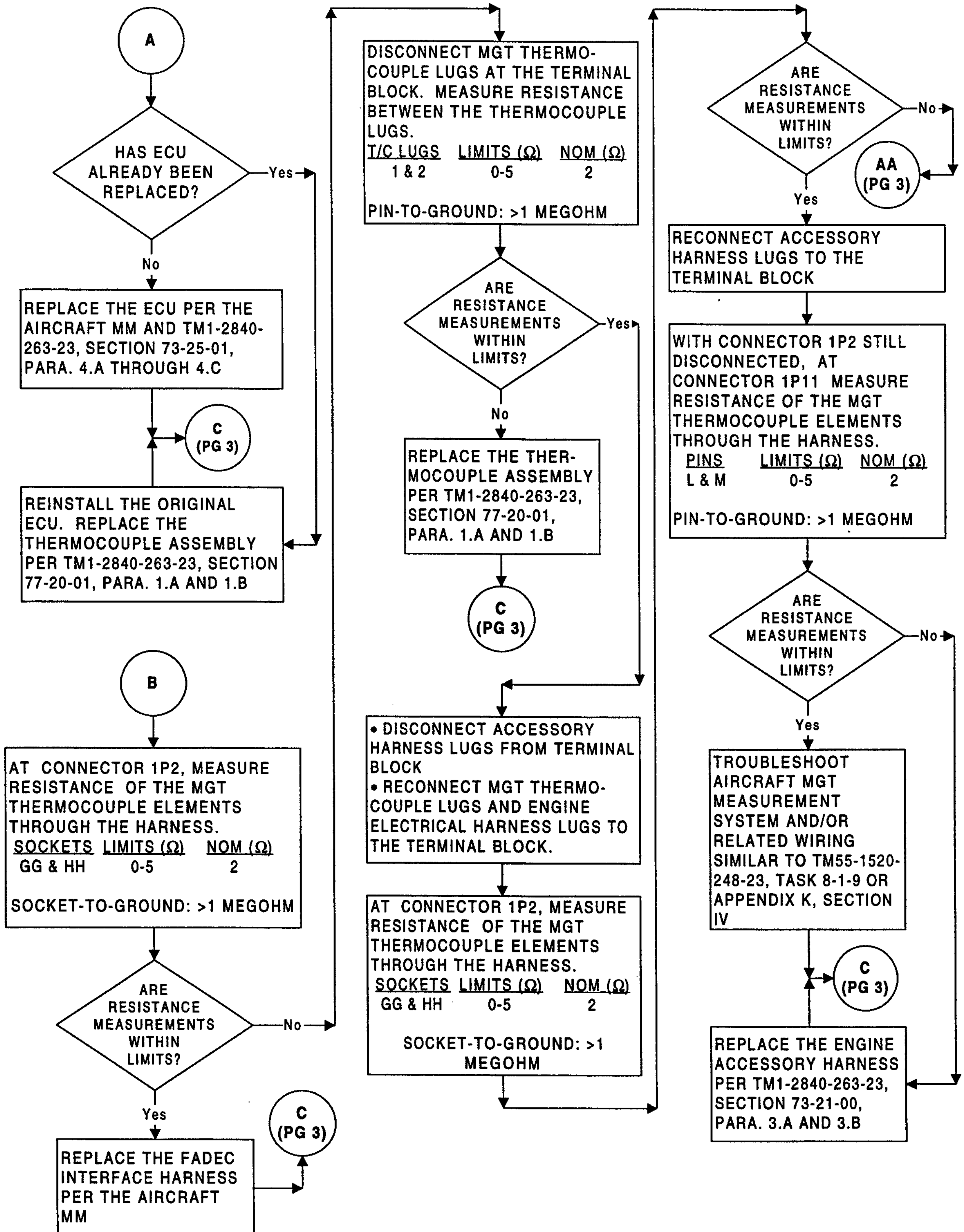
21 AUG 1998

10. MGT THERMOCOUPLE CIRCUIT FAULT

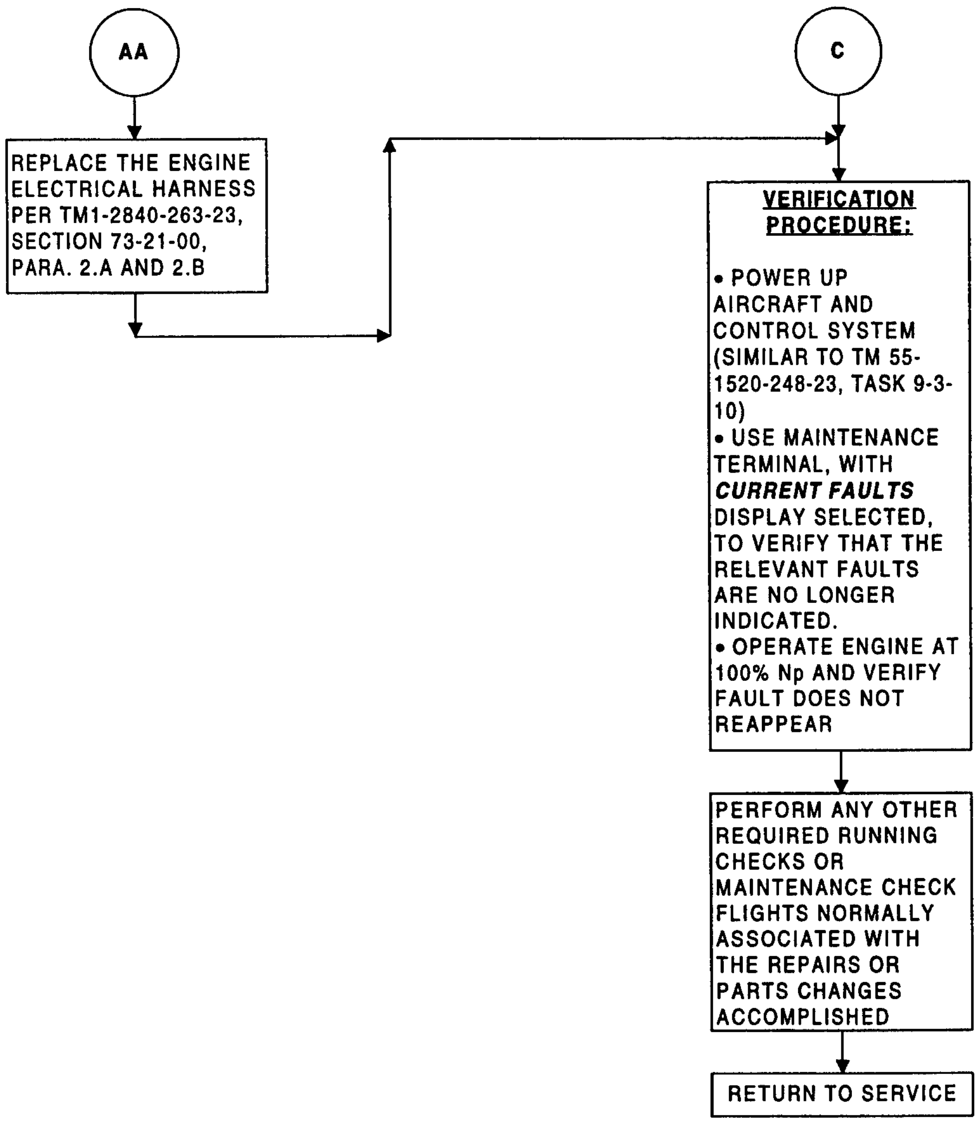


21 AUG 1998

10. MGT THERMOCOUPLE CIRCUIT FAULT



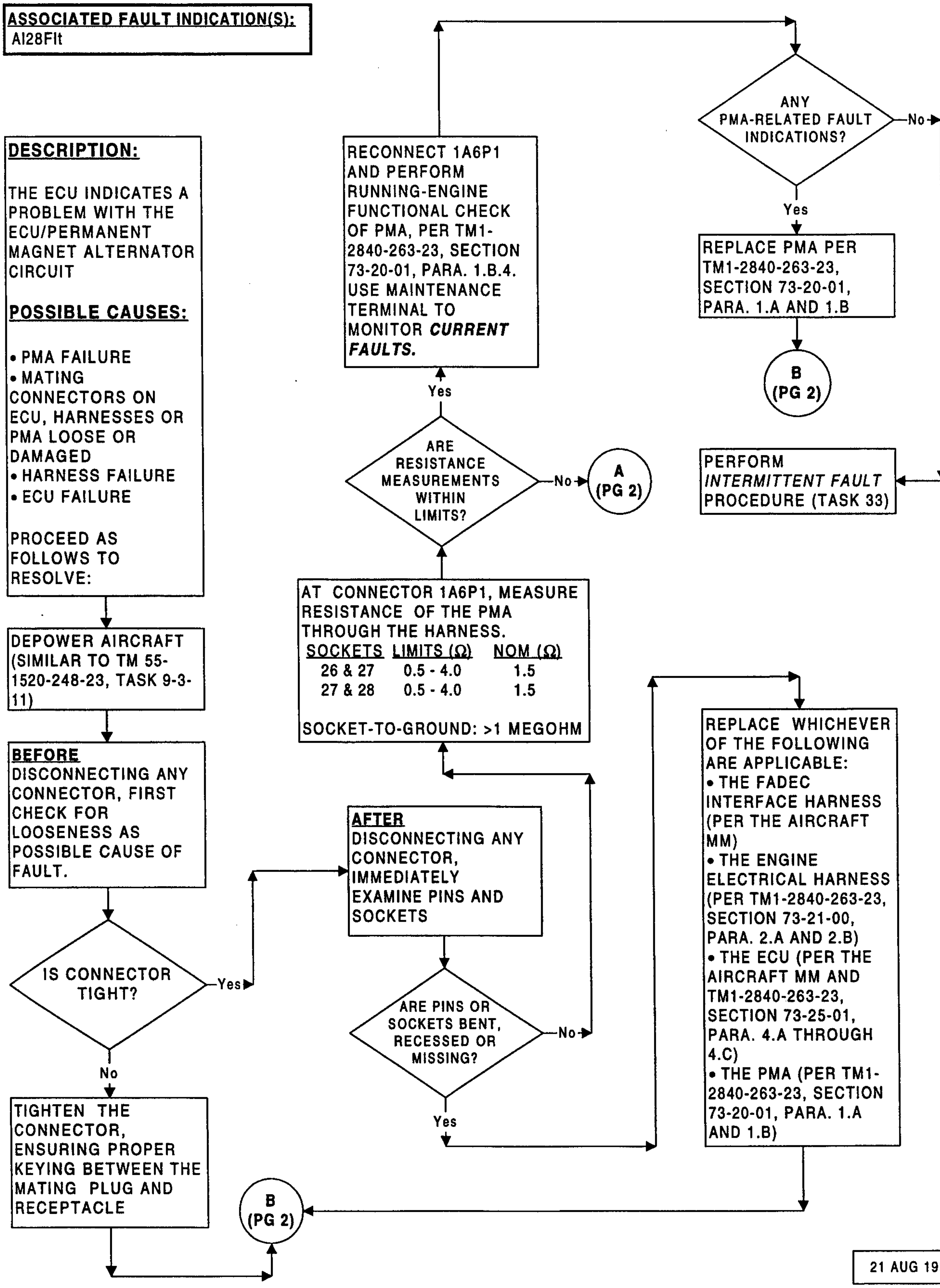
21 AUG 1998


AA
C
REPLACE THE ENGINE ELECTRICAL HARNESS PER TM1-2840-263-23, SECTION 73-21-00, PARA. 2.A AND 2.B
VERIFICATION PROCEDURE:
• POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
• USE MAINTENANCE TERMINAL, WITH *CURRENT FAULTS* DISPLAY SELECTED, TO VERIFY THAT THE RELEVANT FAULTS ARE NO LONGER INDICATED.
• OPERATE ENGINE AT 100% Np AND VERIFY FAULT DOES NOT REAPPEAR
PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED
RETURN TO SERVICE

21 AUG 1998

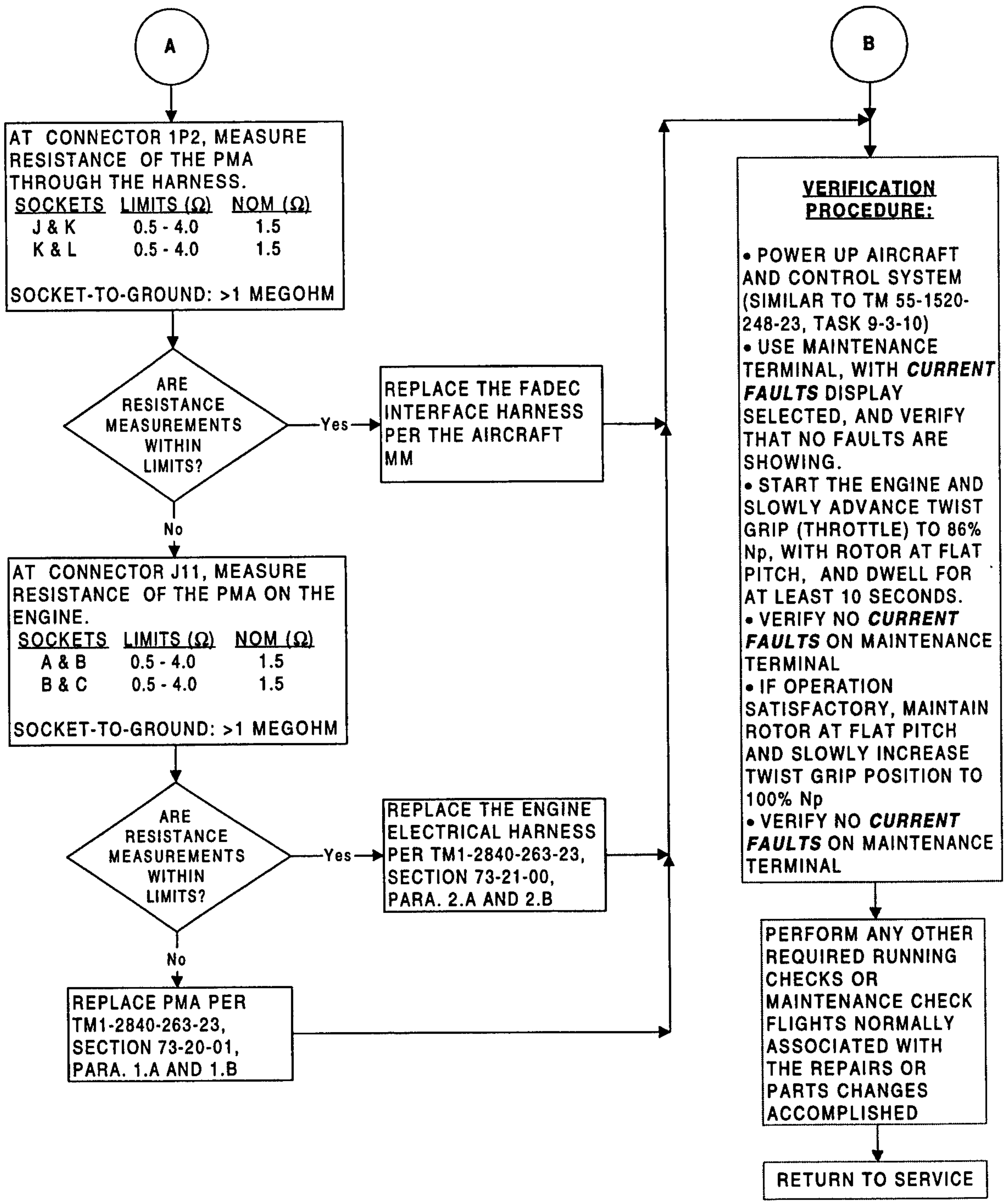
11. PERMANENT MAGNET ALTERNATOR (PMA) CIRCUIT FAULT

ASSOCIATED FAULT INDICATION(S):
AI28Flt



21 AUG 1998

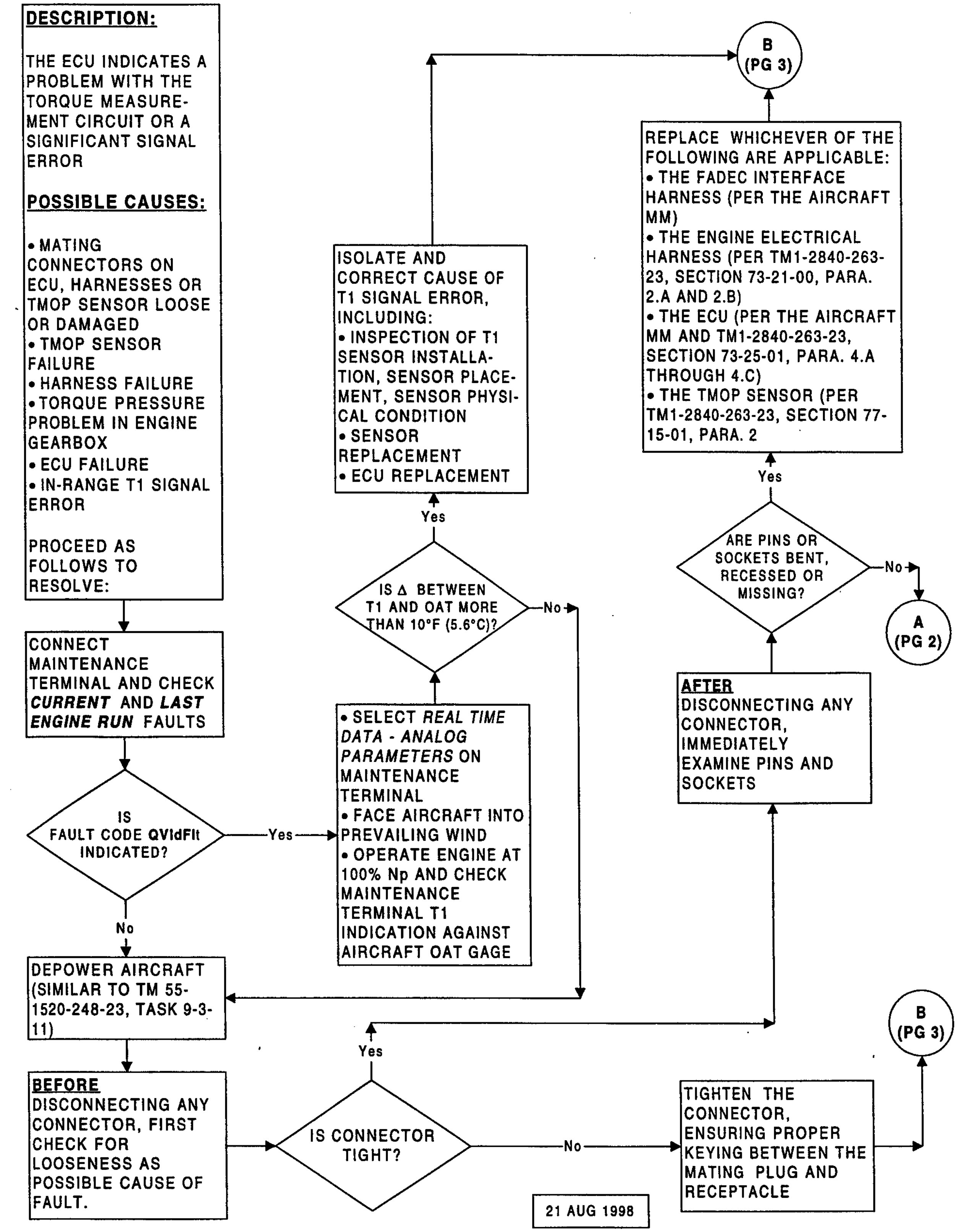
11. PERMANENT MAGNET ALTERNATOR (PMA) CIRCUIT FAULT

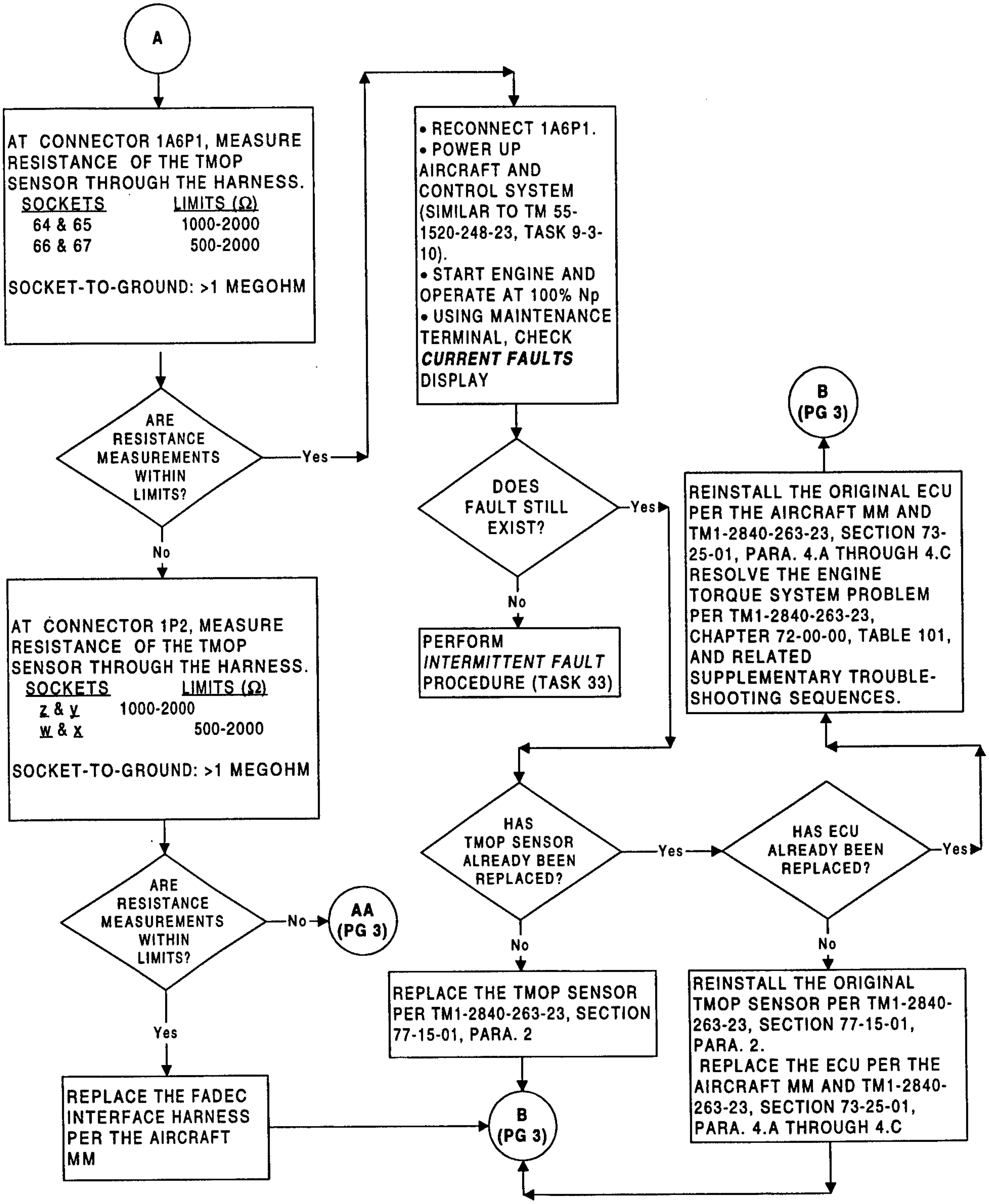


21 AUG 1998

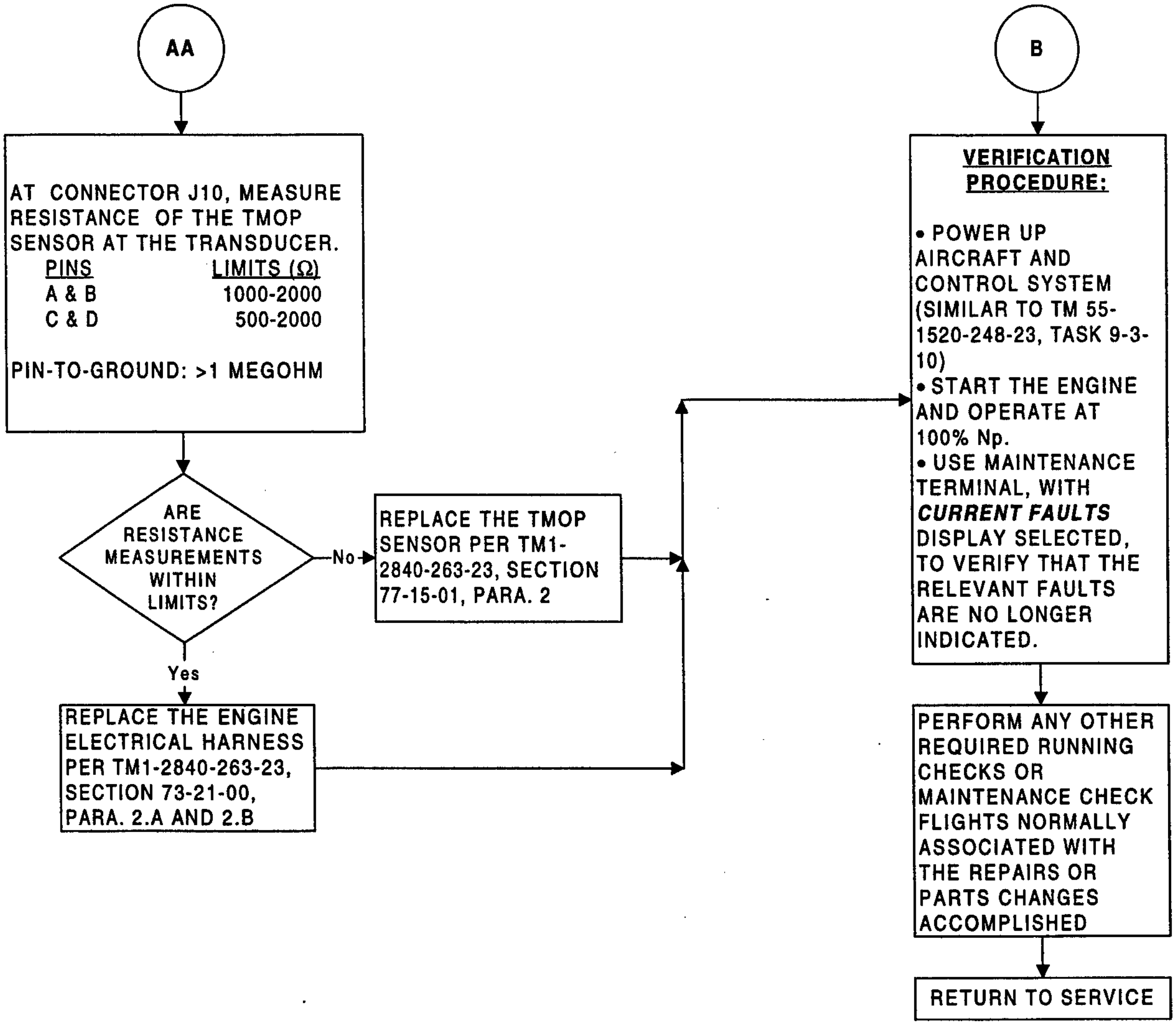
12. TORQUE (TMOP OR Q) MEASUREMENT FAULT

ASSOCIATED FAULT INDICATION(S):
QFlt, QRgFlt, QRtFlt, QVldFlt




A
AT CONNECTOR 1A6P1, MEASURE RESISTANCE OF THE TMOP SENSOR THROUGH THE HARNESS.
SOCKETS LIMITS (Ω)
64 & 65 1000-2000
66 & 67 500-2000
SOCKET-TO-GROUND: >1 MEGOHM
ARE RESISTANCE MEASUREMENTS WITHIN LIMITS?
Yes
No
AT CONNECTOR 1P2, MEASURE RESISTANCE OF THE TMOP SENSOR THROUGH THE HARNESS.
SOCKETS LIMITS (Ω)
z & y 1000-2000
w & x 500-2000
SOCKET-TO-GROUND: >1 MEGOHM
ARE RESISTANCE MEASUREMENTS WITHIN LIMITS?
No
AA (PG 3)
Yes
REPLACE THE FADEC INTERFACE HARNESS PER THE AIRCRAFT MM
• RECONNECT 1A6P1.
• POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10).
• START ENGINE AND OPERATE AT 100% Np
• USING MAINTENANCE TERMINAL, CHECK CURRENT FAULTS DISPLAY
DOES FAULT STILL EXIST?
Yes
No
PERFORM INTERMITTENT FAULT PROCEDURE (TASK 33)
HAS TMOP SENSOR ALREADY BEEN REPLACED?
Yes
No
REPLACE THE TMOP SENSOR PER TM1-2840-263-23, SECTION 77-15-01, PARA. 2
B (PG 3)
HAS ECU ALREADY BEEN REPLACED?
Yes
No
REINSTALL THE ORIGINAL TMOP SENSOR PER TM1-2840-263-23, SECTION 77-15-01, PARA. 2.
REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C
REINSTALL THE ORIGINAL ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C RESOLVE THE ENGINE TORQUE SYSTEM PROBLEM PER TM1-2840-263-23, CHAPTER 72-00-00, TABLE 101, AND RELATED SUPPLEMENTARY TROUBLE-SHOOTING SEQUENCES.
B (PG 3)

21 AUG 1998


AA
AT CONNECTOR J10, MEASURE RESISTANCE OF THE TMOP SENSOR AT THE TRANSDUCER.
PINS LIMITS (Ω)
A & B 1000-2000
C & D 500-2000
PIN-TO-GROUND: >1 MEGOHM
ARE RESISTANCE MEASUREMENTS WITHIN LIMITS?
No
REPLACE THE TMOP SENSOR PER TM1-2840-263-23, SECTION 77-15-01, PARA. 2
Yes
REPLACE THE ENGINE ELECTRICAL HARNESS PER TM1-2840-263-23, SECTION 73-21-00, PARA. 2.A AND 2.B
B
VERIFICATION PROCEDURE:
• POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
• START THE ENGINE AND OPERATE AT 100% Np.
• USE MAINTENANCE TERMINAL, WITH CURRENT FAULTS DISPLAY SELECTED, TO VERIFY THAT THE RELEVANT FAULTS ARE NO LONGER INDICATED.
PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED
RETURN TO SERVICE

21 AUG 1998

13. COLLECTIVE PITCH (CP) POTENTIOMETER CIRCUIT FAULT

ASSOCIATED FAULT INDICATION(S):
CPAntFlt, CPFlt, CPRgFlt

DESCRIPTION:

THE ECU INDICATES A PROBLEM WITH THE ECU/ COLLECTIVE PITCH POSITION POTENTIOMETER CIRCUIT

POSSIBLE CAUSES:

- MATING CONNECTORS ON ECU, HARNESSES OR CP POTENTIOMETER LOOSE OR DAMAGED
- CP POTENTIOMETER FAILURE
- AIRCRAFT COLLECTIVE PITCH POTENTIOMETER RIGGING EXCEEDS NORMAL TRAVEL LIMITS
- HARNESS FAILURE
- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

- DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)
- SET COLLECTIVE PITCH LEVER TO ABOUT 50% (NEAR MID-TRAVEL) POSITION

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT?

No → TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE → D (PG 3)

Yes → **AFTER** DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING?

Yes → REPLACE (OR REPAIR) WHICHEVER OF THE FOLLOWING ARE APPLICABLE:
- THE INTERCONNECTING AIRCRAFT WIRING BETWEEN THE CP POTENTIOMETER AND THE ECU (SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV)
- THE ECU (PER THE AIRCRAFT MM AND TM 1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)
- THE CP POTENTIOMETER (SIMILAR TO TM 55-1520-248-23, TASK 11-2-1), AND RIG PER TM 1-2840-263-23

→ D (PG 3)

No → AT CONNECTOR 1A6P2, MEASURE RESISTANCE OF THE POTENTIOMETER THROUGH THE HARNESS.

SOCKETS	LIMITS (Ω)	NOM (Ω)
64 & 65	4250 - 5750	5000

-AND-

SUM OF RESISTANCE VALUES BETWEEN SOCKETS 63 & 65 AND BETWEEN SOCKETS 63 & 64 EQUAL TO OR GREATER THAN RESISTANCE BETWEEN SOCKETS 64 & 65

SOCKET-TO-GROUND: >1 MEGOHM

ARE RESISTANCE MEASUREMENTS WITHIN LIMITS?

No → C (PG 2)

Yes → HOLD COLLECTIVE PITCH LEVER FULL DOWN AND MEASURE RESISTANCE OF THE POTENTIOMETER THROUGH THE HARNESS.

SOCKETS	LIMITS (Ω)	NOM (Ω)
64 & 65	4250 - 5750	5000
63 & 65	700 - 1300	1000
63 & 64	3200 - 4900	4000

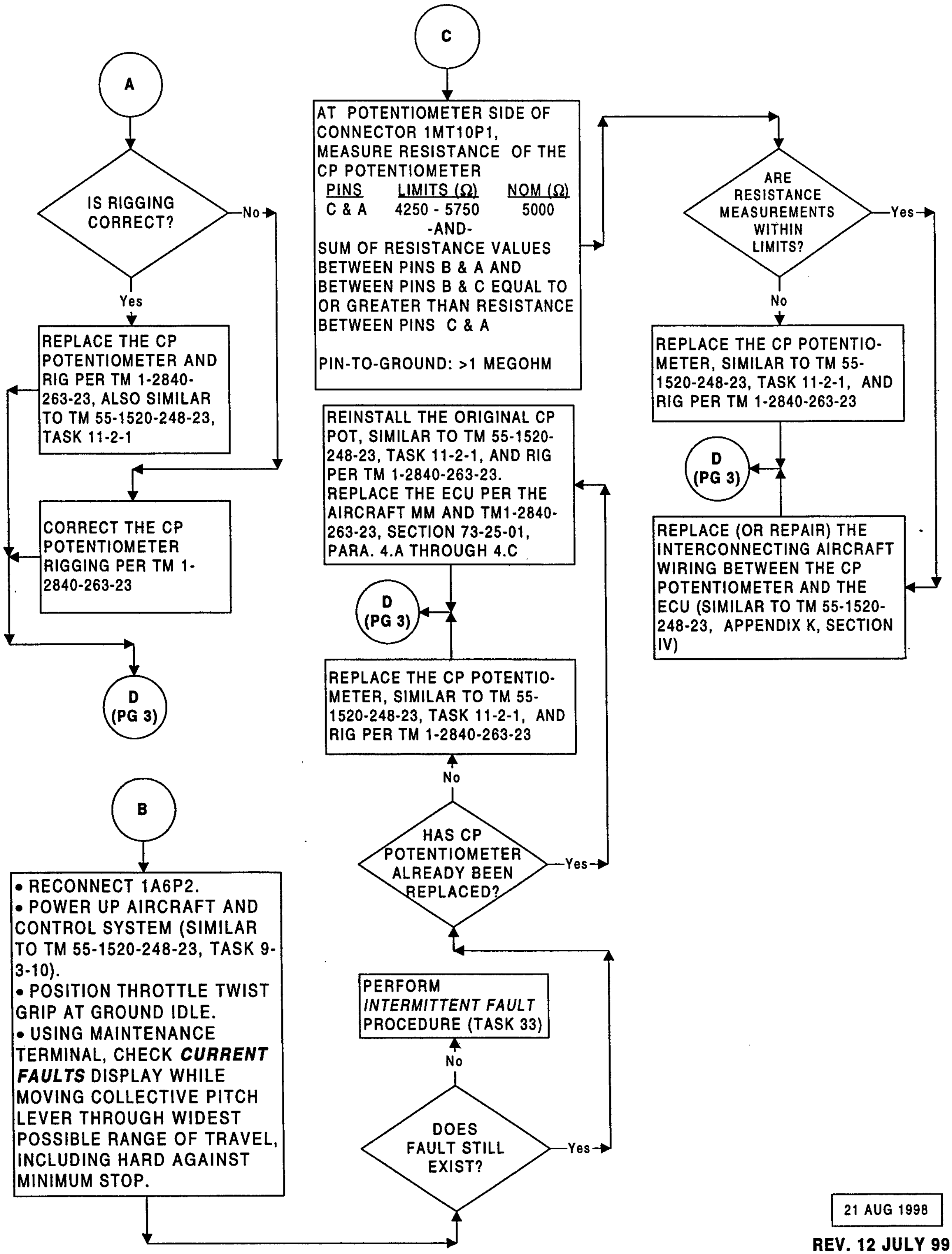
SOCKET-TO-GROUND: >1 MEGOHM

ARE RESISTANCE MEASUREMENTS WITHIN LIMITS?

Yes → B (PG 2)

No → CHECK CP POTENTIOMETER RIGGING (RANGE OF MOTION AND POSITION ADJUSTMENTS) PER TM 1-2840-263-23, AND SIMILAR TO TM 55-1520-248-23, TASK 11-2-1 → A (PG 2)

21 AUG 1998



21 AUG 1998

REV. 12 JULY 99

13. COLLECTIVE PITCH (CP) POTENTIOMETER CIRCUIT FAULT

D

↓

VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- USE MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED, TO VERIFY THAT THE RELEVANT FAULTS ARE NO LONGER INDICATED.
- POSITION THROTTLE TWIST GRIP AT GROUND IDLE AND MOVE COLLECTIVE PITCH LEVER THROUGH WIDEST RANGE OF TRAVEL ACHIEVABLE

↓

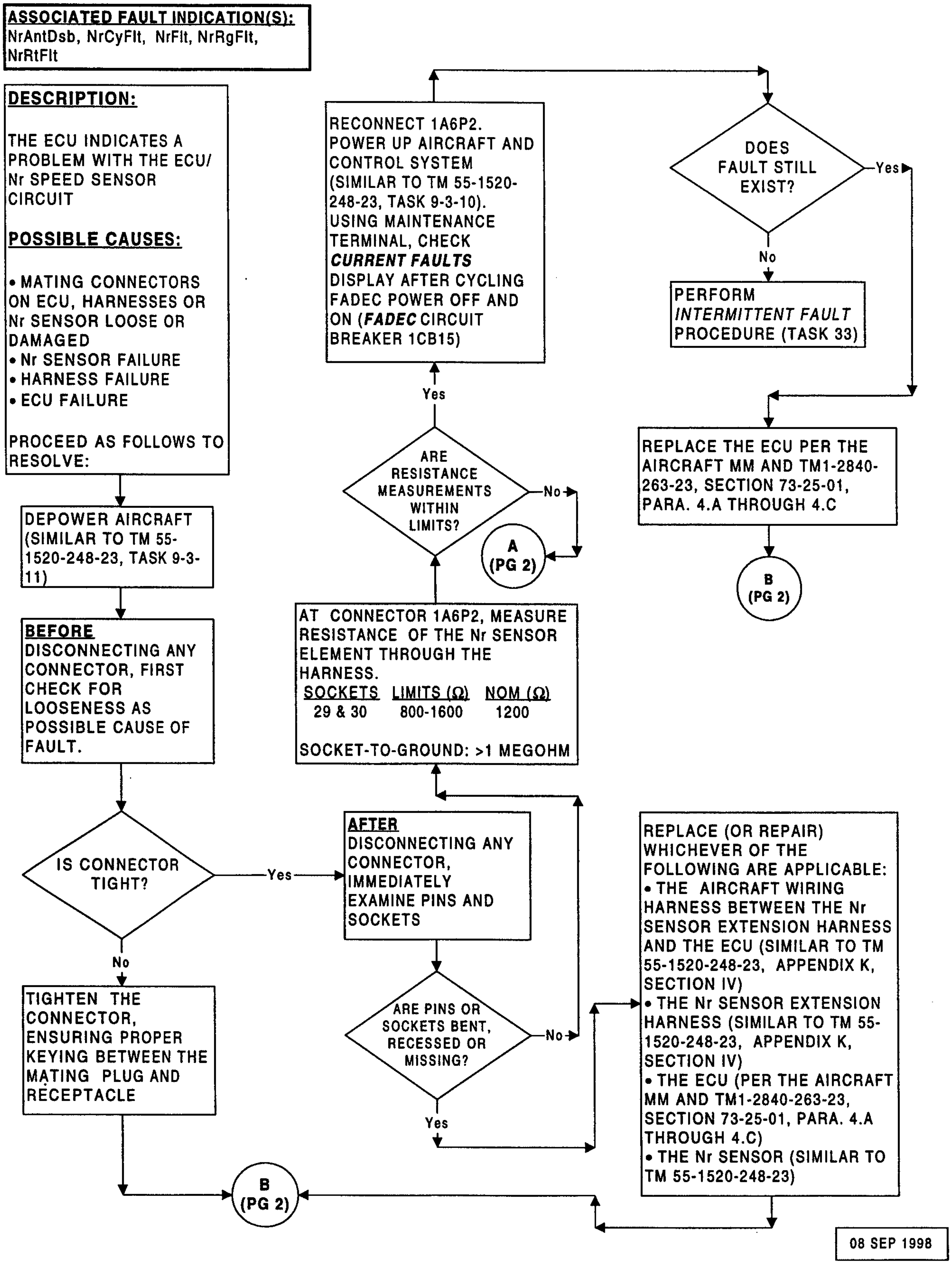
PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

↓

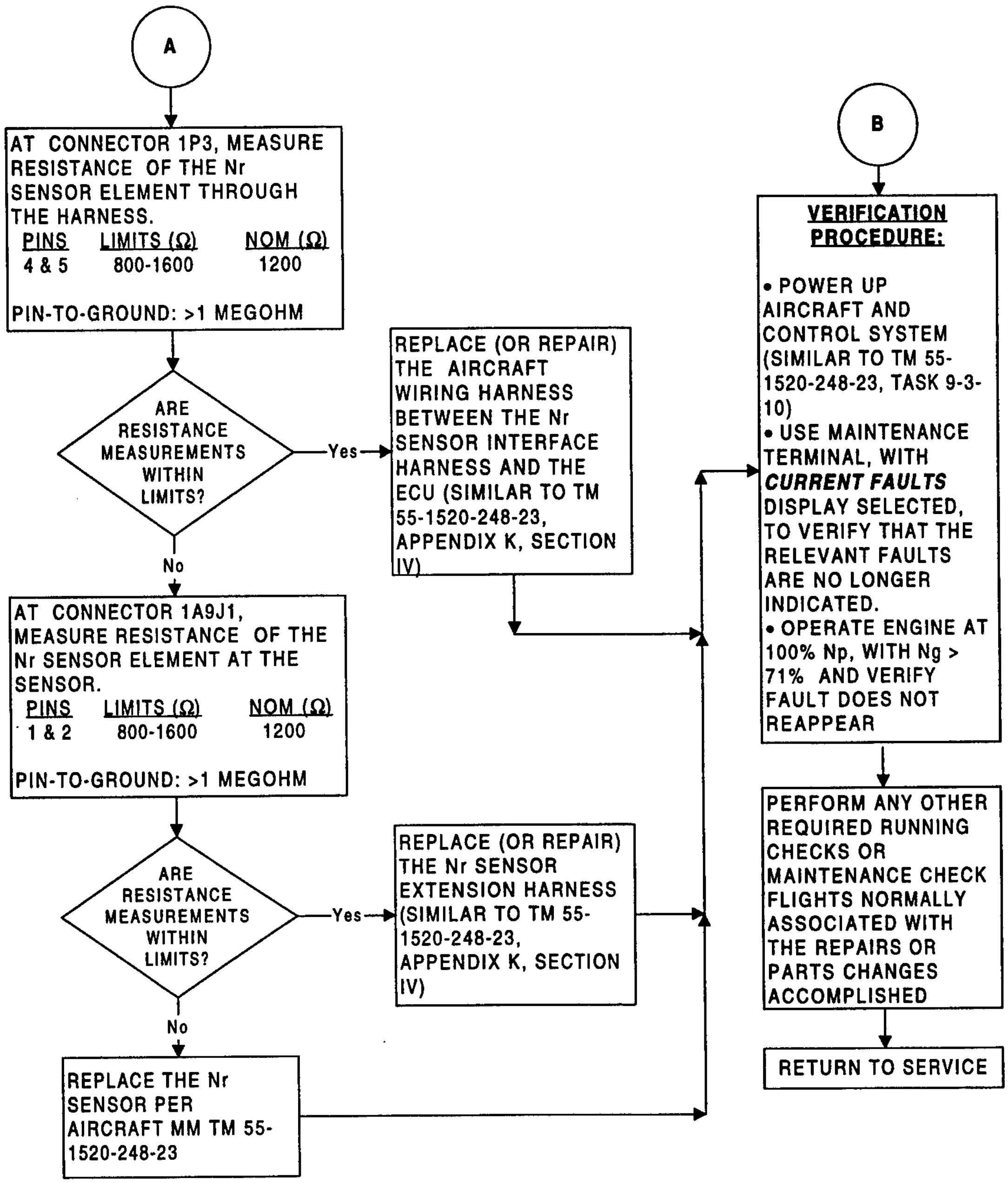
RETURN TO SERVICE

21 AUG 1998

14. N_R SPEED SENSOR CIRCUIT FAULT



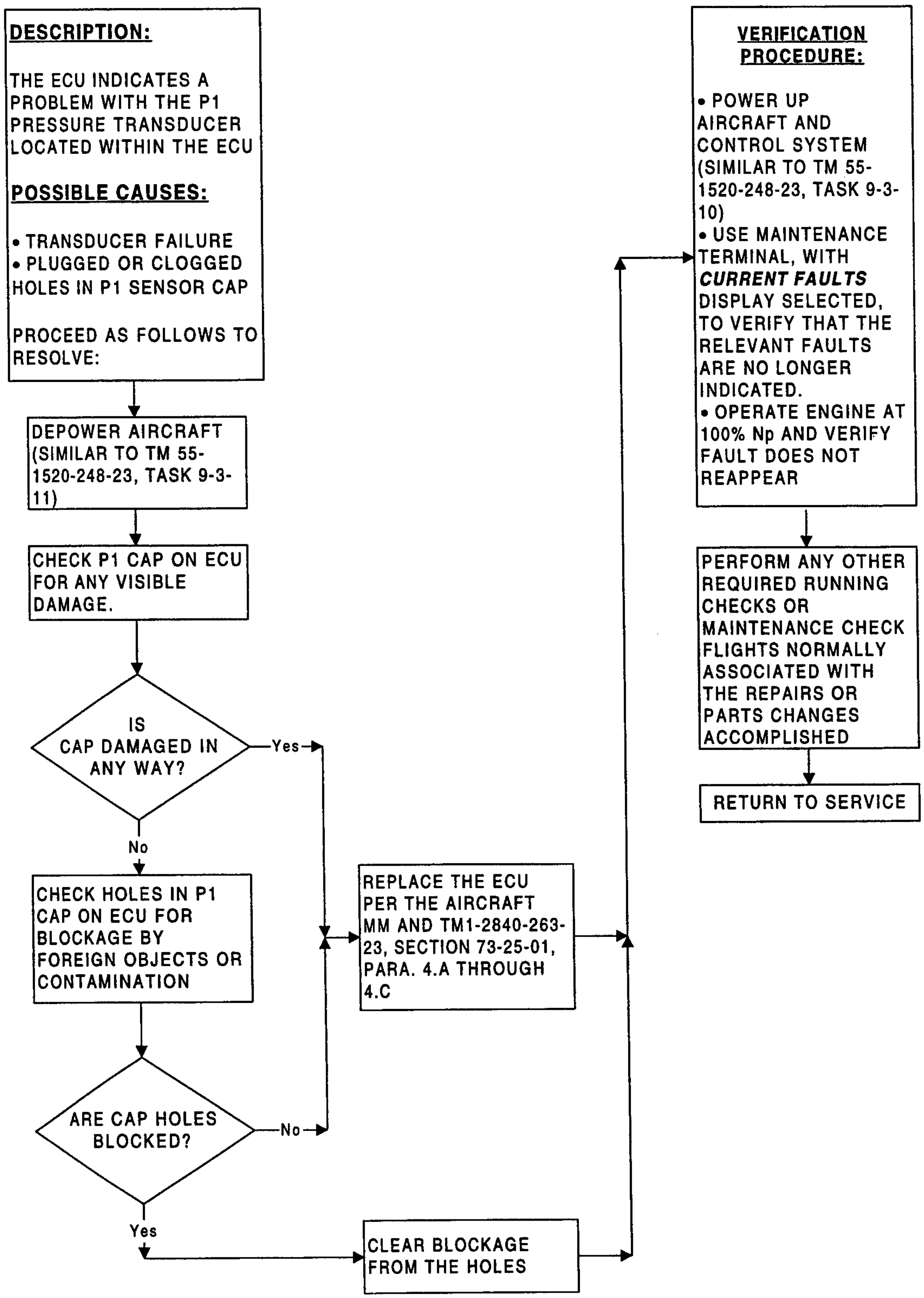
14. N_R SPEED SENSOR CIRCUIT FAULT



08 SEP 1998

15. ECU P_1 TRANSDUCER FAULT

ASSOCIATED FAULT INDICATION(S):
P1Flt, P1HdFlt, P1RgFlt, P1RtFlt



21 AUG 1998

16. ECU INTERNAL FAULT

ASSOCIATED FAULT INDICATION(S):
AD12BitFlt, AD8BitFlt, ARINCHWFlt, BacCompFlt, BVIFlt, CJCFlt, CJCRgFlt, CJCRtFlt, ECUOTFlt, EECalFlt, EEHistFlt, EEPROMFlt, ForCompFlt, GainFlt, GainRgFlt, HLRfFlt, HLRfRgFlt, IgnFlt, Not Used, OffsFlt, OffsRgFlt, OrDiodeFlt, OSVFlt, OSVRgFlt, PROMFlt, PW10Flt, PW10RgFlt, RAMFlt, StrFlt, SWIntFlt, UARTFlt, UUIntFlt, V15Flt, V15RgFlt, V5Flt, V5RgFlt, WDTFlt, WDTOutFlt

DESCRIPTION:

THE ECU INDICATES A PROBLEM INTERNAL TO THE ECU

POSSIBLE CAUSES:

- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

NOTE: DO NOT START ENGINE UNTIL THIS STEP IS PERFORMED:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10).
- USING MAINTENANCE TERMINAL, CHECK *CURRENT FAULTS* AND *LAST ENGINE RUN* FAULTS DISPLAYS AFTER CYCLING FADEC POWER OFF AND ON (FADEC CIRCUIT BREAKER 1CB15)
- TABULATE FAULT CODES DISPLAYED

ARE ALL ORIGINALLY REPORTED FAULT CODES STILL PRESENT?

Yes

No

ARE ANY OF THE ABOVE LISTED FAULT CODES PRESENT?

Yes

No

REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C

INITIAL FAULT CODES WERE MISREPORTED. IF ANY OTHER FAULT CODES ARE SHOWING, ISOLATE AND REPAIR PER THE APPLICABLE PROCEDURE

VERIFICATION PROCEDURE:

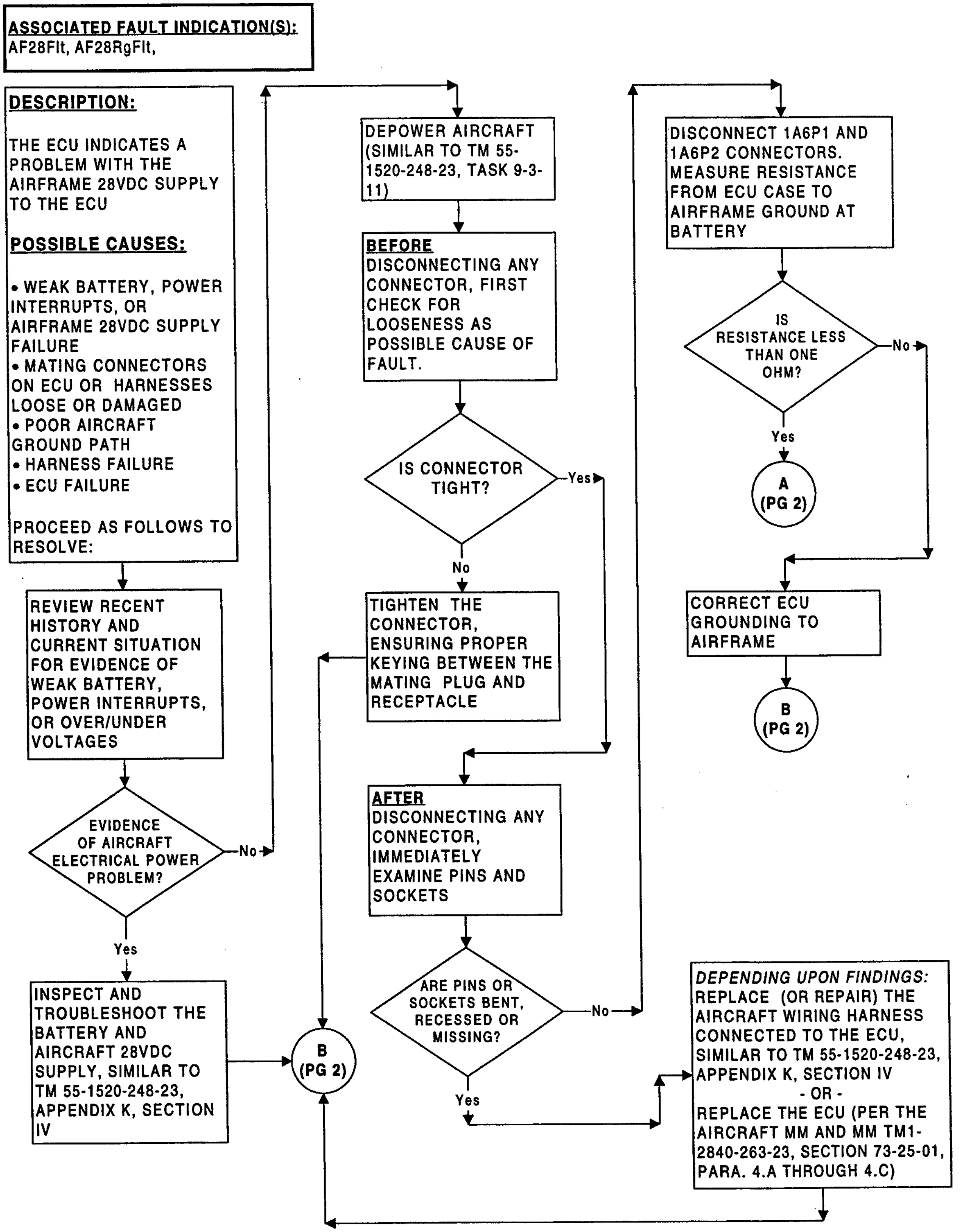
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- USE MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED, TO VERIFY THAT THE RELEVANT FAULTS ARE NO LONGER INDICATED.
- OPERATE ENGINE AT 100% Np AND VERIFY FAULTS DO NOT REAPPEAR

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

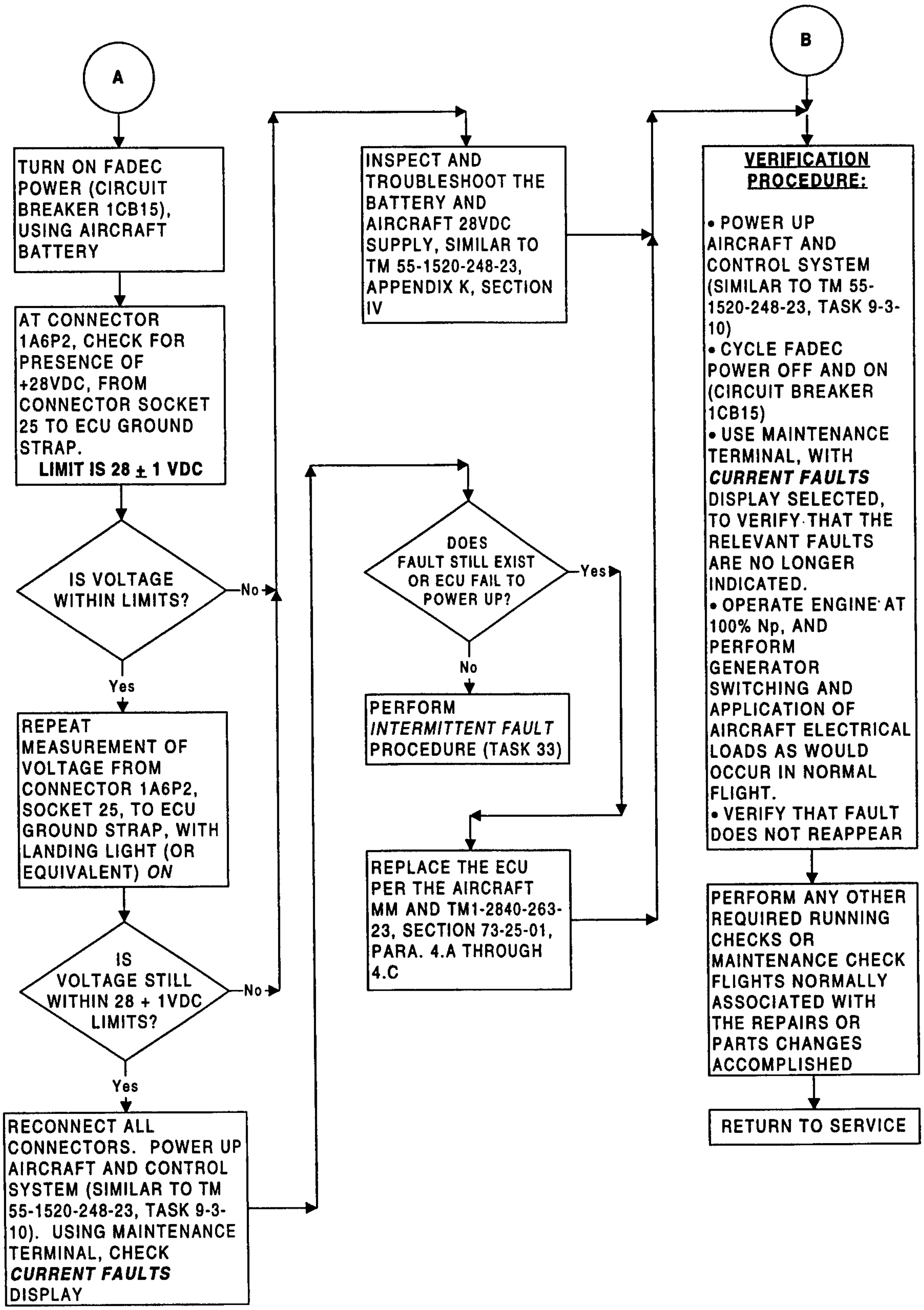
21 AUG 1998

17. AIRFRAME 28VDC SUPPLY FAULT



21 AUG 1998

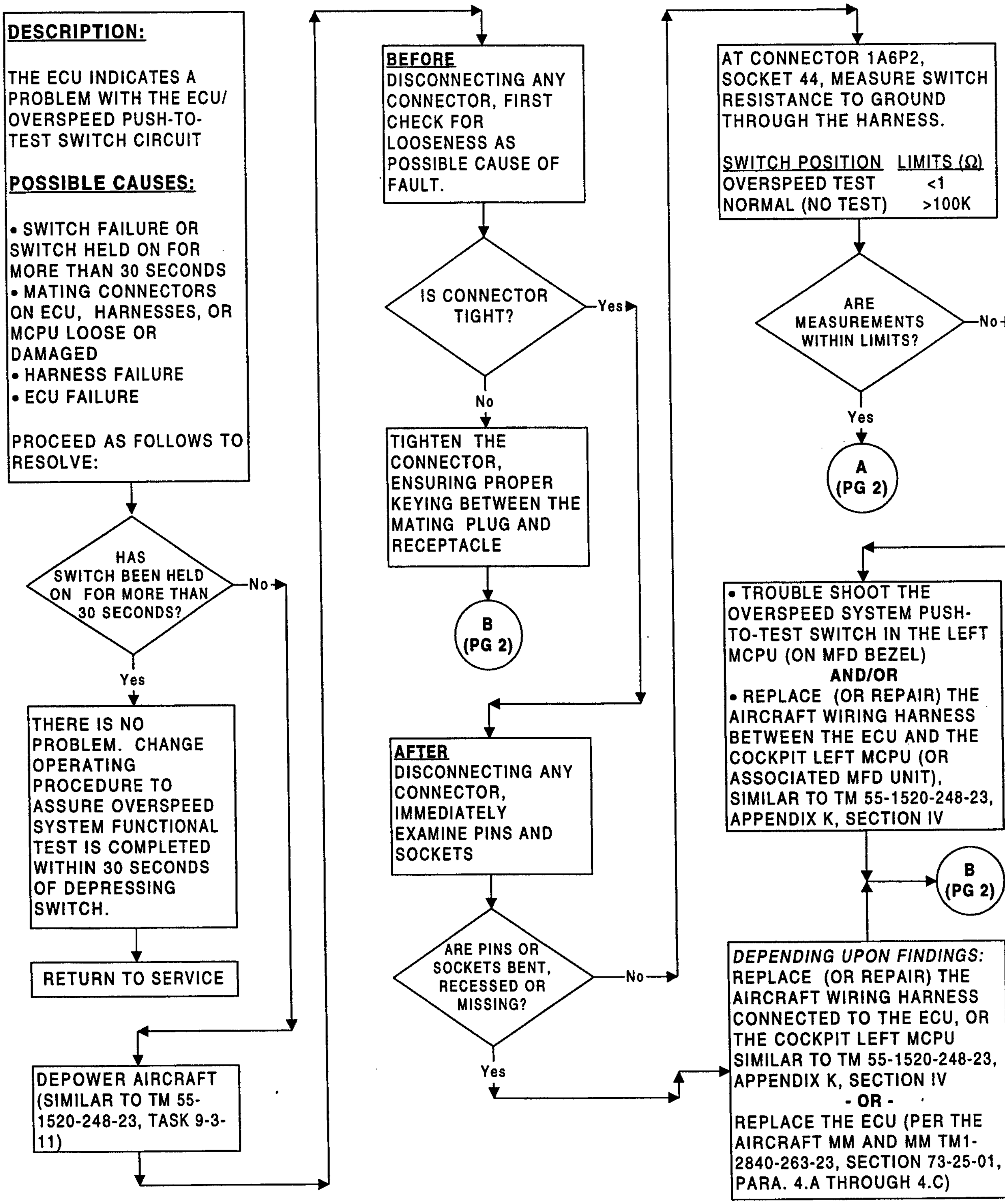
17. AIRFRAME 28VDC SUPPLY FAULT



21 AUG 1998

18. OVERSPEED SYSTEM PUSH-TO-TEST SWITCH CIRCUIT FAULT

ASSOCIATED FAULT INDICATION(S):
OSTstSwFlt



21 AUG 1998

18. OVERSPEED SYSTEM PUSH-TO-TEST SWITCH CIRCUIT FAULT

A

AT CONNECTOR 1A6P2, SOCKET 44, MEASURE SWITCH RESISTANCE TO GROUND THROUGH THE HARNESS WHILE SWITCHING BETWEEN STATES

SWITCH POSITION	LIMITS (Ω)
OVERSPEED TEST	<1
NORMAL (NO TEST)	>100K

EVIDENCE OF STICKING DURING STATE CHANGES?

Yes: REPLACE MFD UNIT ASSOCIATED WITH LEFT MCPU (3431A1) PER AIRCRAFT MM

No:

- REATTACH CONNECTOR 1A6P2 TO ECU.
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- CONNECT MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED
- HOLD DOWN OVERSPEED PRESS-TO-TEST SWITCH FOR FIVE SECONDS AND RELEASE.

DOES FAULT STILL EXIST?

No: PERFORM *INTERMITTENT FAULT* PROCEDURE (TASK 33)

Yes: REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C

B

VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- USE MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED
- HOLD DOWN OVERSPEED PRESS-TO-TEST SWITCH FOR FIVE SECONDS AND RELEASE.
- VERIFY THAT THE RELEVANT FAULTS ARE NO LONGER INDICATED.
- START ENGINE, OPERATE AT GROUND IDLE, AND PERFORM AN OVERSPEED SHUTDOWN TEST
- VERIFY THAT FAULT DOES NOT REAPPEAR

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

21 AUG 1998

19. FADEC MODE SWITCH CIRCUIT FAULT

ASSOCIATED FAULT INDICATION(S):
AMSwFlt

DESCRIPTION:

THE ECU INDICATES A PROBLEM WITH THE ECU/ FADEC MODE SWITCH CIRCUIT

POSSIBLE CAUSES:

- MATING CONNECTORS ON ECU, HARNESSES, OR COCKPIT INSTRUMENT PANEL LOOSE OR DAMAGED
- SWITCH FAILURE
- ECU FAILURE
- HARNESS FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT?

No

TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE

B (PG 2)

Yes

AFTER DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING?

Yes

DEPENDING UPON FINDINGS:
REPLACE (OR REPAIR) THE AIRCRAFT WIRING HARNESS CONNECTED TO THE ECU AND TO THE COCKPIT FADEC *AUTO-MANUAL* SWITCH SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV
- OR -
REPLACE THE ECU (PER THE AIRCRAFT MM AND MM TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)

B (PG 2)

No

AT CONNECTOR 1A6P2, MEASURE SWITCH RESISTANCE TO GROUND THROUGH THE HARNESS.

SWITCH POS	SOCKET	LIMITS (Ω)
AUTO	45	<1
AUTO	49	>100K
AUTO	12	>100K
MANUAL	45	>100K
MANUAL	49	<1
MANUAL	12	<1

ARE RESISTANCE MEASUREMENTS WITHIN LIMITS?

No

A (PG 2)

Yes

RECONNECT 1A6P2. POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10). USING MAINTENANCE TERMINAL, CHECK ***CURRENT FAULTS*** DISPLAY AFTER SWITCHING FROM AUTO TO MANUAL TO AUTO

DOES FAULT STILL EXIST?

No

PERFORM *INTERMITTENT FAULT* PROCEDURE (TASK 33)

Yes

REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C

B (PG 2)

21 AUG 1998

19. FADEC MODE SWITCH CIRCUIT FAULT

A

TROUBLESHOOT, REPAIR, OR REPLACE THE FADEC *AUTO-MANUAL* SWITCH AND/OR THE AIRCRAFT WIRING HARNESS CONNECTED TO THE ECU AND TO THE FADEC *AUTO-MANUAL* SWITCH SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV

B

VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- USE MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED
- SELECT MANUAL MODE THEN AUTO MODE TO VERIFY NO FAULT SHOWING IN EITHER MODE.
- START ENGINE (IN AUTO MODE) AND OPERATE AT GROUND IDLE
- SELECT MANUAL MODE THEN AUTO MODE TO VERIFY PROPER TRANSITION INTO EACH MODE
- VERIFY THAT FAULT DOES NOT REAPPEAR

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

21 AUG 1998

20. IGNITION CIRCUIT FAULT

ASSOCIATED FAULT INDICATION(S):
IgnIFlt

DESCRIPTION:

THE ECU INDICATES A PROBLEM WITH THE IGNITION CIRCUIT

POSSIBLE CAUSES:

- RELAY OR SWITCH FAILURE IN AIRCRAFT IGNITION CIRCUIT
- MATING CONNECTORS ON ECU OR AIRCRAFT HARNESSES LOOSE OR DAMAGED
- HARNESS FAILURE
- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10). USING MAINTENANCE TERMINAL, CHECK ***CURRENT FAULTS*** DISPLAY AFTER CYCLING ECU POWER *OFF* AND *ON* (**FADEC** CIRCUIT BREAKER 1CB15)

DOES FAULT STILL EXIST?

Yes

REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C

C (PG 2)

No

DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT?

No

TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE

C (PG 2)

Yes

AFTER DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING?

Yes

DEPENDING UPON FINDINGS:
REPLACE (OR REPAIR) THE AIRCRAFT WIRING HARNESS AT ECU (CONNECTOR 1A6P2) SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV
- OR -
REPLACE THE ECU (PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)

C (PG 2)

No

- DISCONNECT AIRCRAFT HARNESS CONNECTOR 1A6P2 FROM ECU
- CONNECT A JUMPER WIRE FROM SOCKET NO. 7 OF 1A6P2 TO AIRCRAFT GROUND
- PLACE TWIST GRIP IN CUTOFF POSITION AND POWER UP AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11).

IGNITION SYSTEM SHOULD ACTIVATE

DID IGNITION SYSTEM ACTIVATE?

Yes

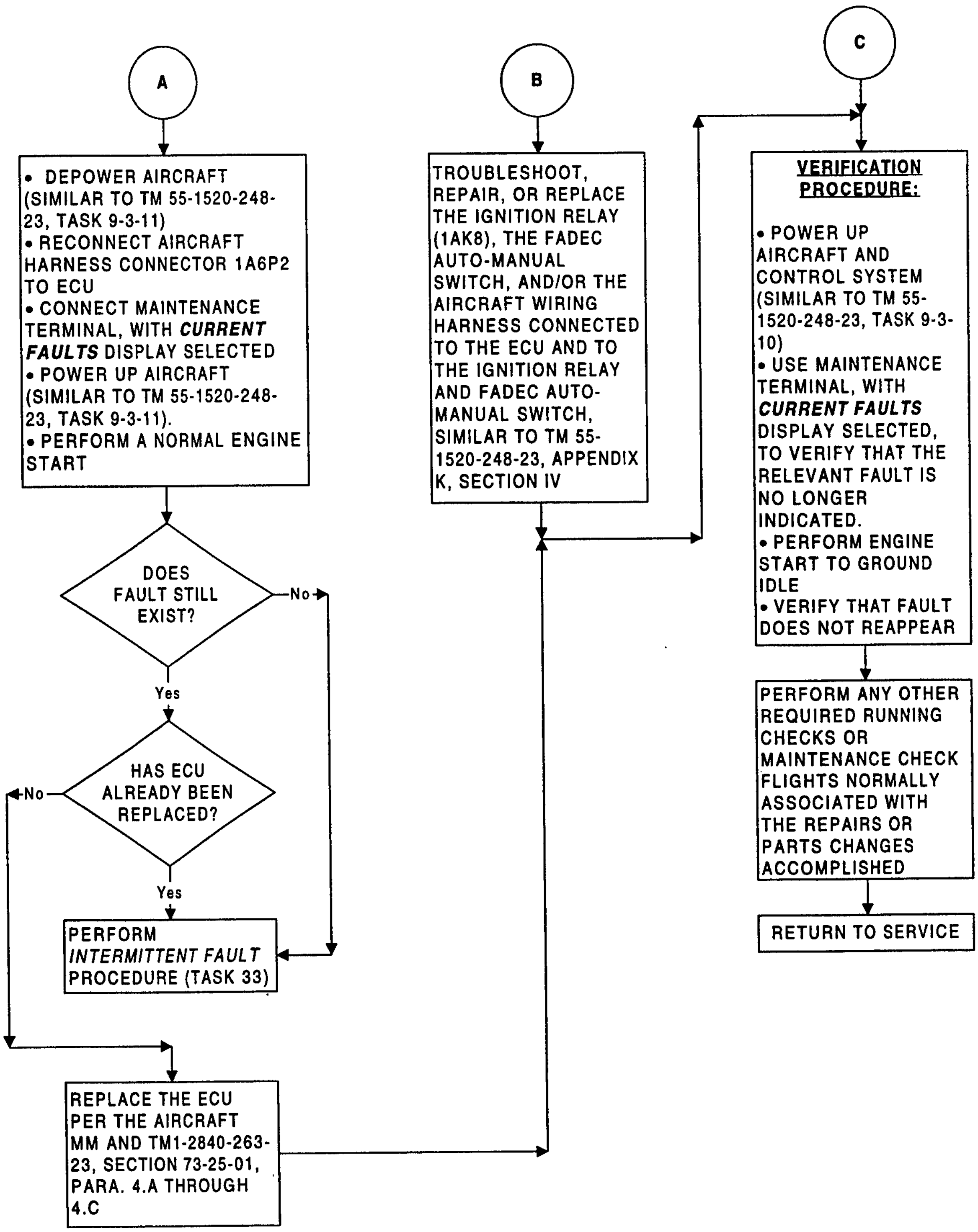
A (PG 2)

No

B (PG 2)

21 AUG 1998

20. IGNITION CIRCUIT FAULT



21. STEP COUNT FAULT

ASSOCIATED FAULT INDICATION(S):
StepCntFlt, WfStFlt, WfStRgFlt

DESCRIPTION:

METERING VALVE POSITION FEEDBACK SIGNAL NOT IN AGREEMENT WITH ECU-COMMANDED POSITION, OR THE STEPPER MOTOR POSITION IS OUT OF RANGE

POSSIBLE CAUSES:

- MATING CONNECTORS ON ECU, HARNESSES OR HMU LOOSE OR DAMAGED
- HARNESS FAILURE
- HMU METERING VALVE, STEPPER MOTOR, OR FEEDBACK POTENTIOMETER IN-RANGE FAILURE
- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE

IS FAULT CODE ***SmFlt*** INDICATED?

Yes → PERFORM TASK 1

No → DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT?

No → TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE → C (PG 2)

Yes → **AFTER** DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING?

Yes → REPLACE WHICHEVER OF THE FOLLOWING ARE APPLICABLE:
- THE FADEC INTERFACE HARNESS (PER THE AIRCRAFT MM)
- THE ENGINE ELECTRICAL HARNESS (PER TM1-2840-263-23, SECTION 73-21-00, PARA. 2.A AND 2.B)
- THE ECU (PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)
- THE HMU (PER TM1-2840-263-23, SECTION 73-21-01, PARA. 1.A THROUGH 1.D)

→ C (PG 2)

No → AT CONNECTOR 1A6P1, MEASURE RESISTANCE OF EACH OF 4 STEPPER MOTOR WINDINGS THROUGH THE HARNESS.

SOCKETS	LIMITS (Ω)	NOM (Ω)
1 & 5	20- 40	30
2 & 5	20- 40	30
3 & 5	20- 40	30
4 & 5	20- 40	30

SOCKET-TO-GROUND: >1 MEGOHM

ARE RESISTANCE MEASUREMENTS WITHIN LIMITS?

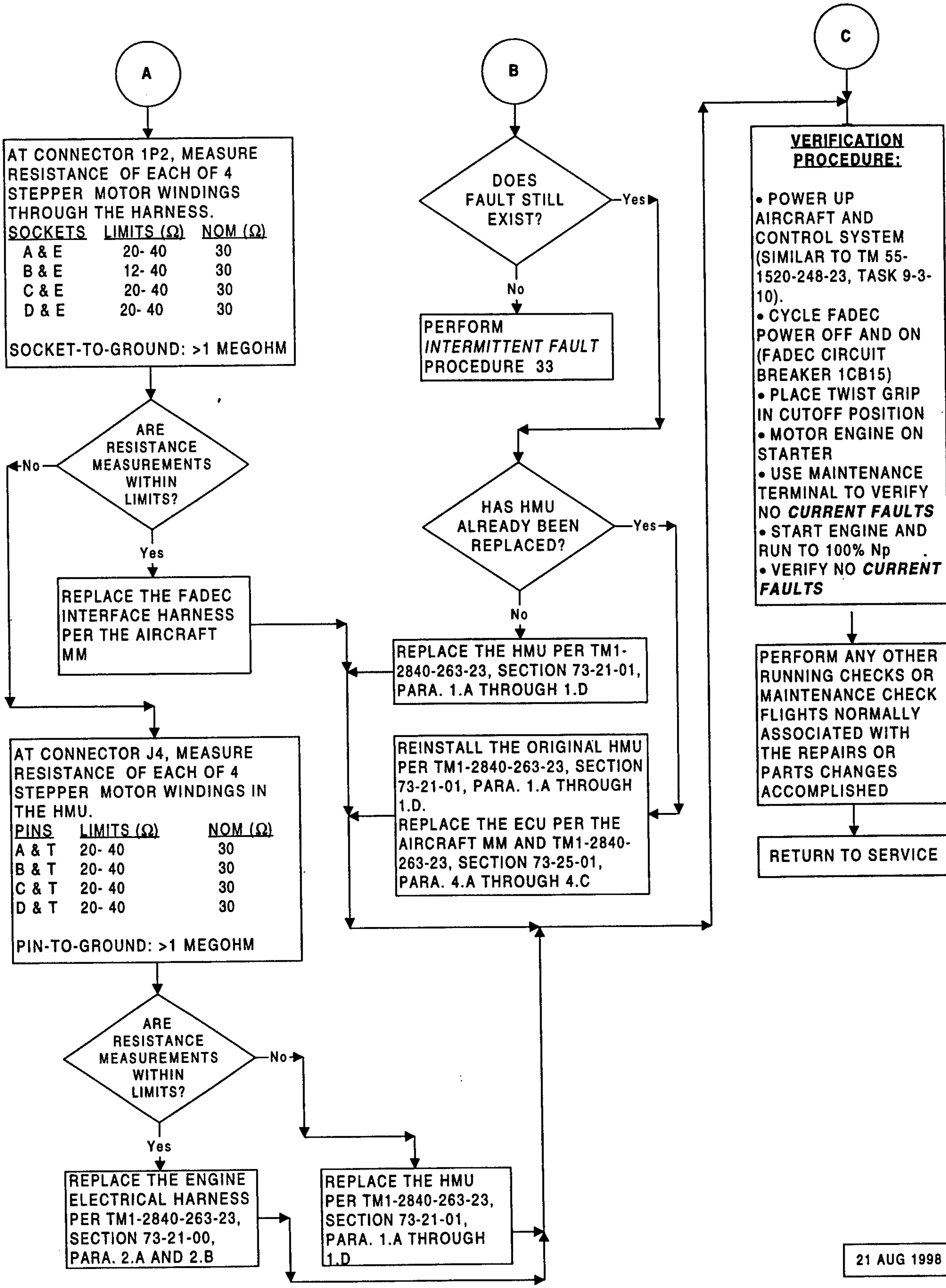
No → A (PG 2)

Yes →
- RECONNECT 1A6P1
- PLACE TWIST GRIP IN CUTOFF POSITION
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- CYCLE FADEC POWER OFF AND ON (FADEC CIRCUIT BREAKER 1CB15)
- MOTOR ENGINE ON STARTER
- USE MAINTENANCE TERMINAL TO CHECK ***CURRENT FAULTS***
- IF NO FAULTS START ENGINE AND RUN TO 100% Np

→ B (PG 2)

21 AUG 1998

21. STEP COUNT FAULT



21 AUG 1998

22. OPEN METERING VALVE INDICATION

ASSOCIATED FAULT INDICATION(S):
OpenMvFlg

DESCRIPTION:

HMU METERING VALVE IS OPEN PRIOR TO ENGINE START

POSSIBLE CAUSES:

- AIRCRAFT BATTERY TURNED OFF AT SHUTDOWN, BEFORE ENGINE STOPPED ROTATING
- THROTTLE OPENED AT SHUTDOWN, BEFORE ENGINE STOPPED ROTATING
- ENGINE WAS NOT SHUT DOWN USING NORMAL SHUTDOWN PROCEDURES
- NEWLY INSTALLED HMU WAS NOT MOTORED WITH THROTTLE IN CUTOFF POSITION
- HMU METERING VALVE WAS NOT CLOSING PROPERLY, OR SPRINGING OPEN AFTER POWERDOWN
- HMU POTENTIOMETER MISADJUSTED OR FAILED IN-RANGE

PROCEED AS FOLLOWS TO RESOLVE:

PERFORM HMU PISTON PARKING PROCEDURE PER TM1-2840-263-23, SECTION 73-21-01, PARA.1.B.(12)

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- CONNECT MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED, AND CYCLE **FADEC** POWER OFF AND ON (FADEC CIRCUIT BREAKER 1CB15)
- WITH CONTROL SYSTEM IN *AUTO* MODE, VERIFY NO ***CURRENT FAULTS*** SHOWING

DOES FAULT STILL EXIST?

No: RETURN TO SERVICE

Yes: REPLACE THE HMU PER TM1-2840-263-23 SECTION 73-21-01, PARA. 1.A THROUGH 1.D

VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- CONNECT MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED, AND CYCLE **FADEC** POWER OFF AND ON (FADEC CIRCUIT BREAKER 1CB15)
- WITH CONTROL SYSTEM IN *AUTO* MODE, VERIFY NO ***CURRENT FAULTS*** SHOWING

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

21 AUG 1998

23. OVERSPEED SYSTEM ENGINE SHUTDOWN TEST FAULT

ASSOCIATED FAULT INDICATION(S):
OSTstFlt

DESCRIPTION:

THE ECU INDICATES A PROBLEM WITH THE OVERSPEED SYSTEM DURING ENGINE SHUTDOWN TEST

POSSIBLE CAUSES:

- HMU OVERSPEED SHUT OFF SOLENOID FAILURE
- ECU FAILURE
- MATING CONNECTORS ON ECU, HARNESSES OR HMU LOOSE OR DAMAGED
- HARNESS FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

CONNECT MAINTENANCE TERMINAL AND CHECK *CURRENT* AND *LAST ENGINE RUN* FAULTS

IS FAULT CODE ***NpOSFlt*** INDICATED?

Yes → PERFORM TASK 24

No → DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT?

No → TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE → C (PG 3)

Yes → **AFTER** DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING?

Yes → REPLACE WHICHEVER OF THE FOLLOWING ARE APPLICABLE:

- THE FADEC INTERFACE HARNESS (PER THE AIRCRAFT MM)
- THE ENGINE ELECTRICAL HARNESS (PER TM1-2840-263-23, SECTION 73-21-00, PARA. 2.A AND 2.B)
- THE ECU (PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)
- THE HMU (PER TM1-2840-263-23, SECTION 73-21-01, PARA. 1.A THROUGH 1.D)

→ C (PG 3)

No → AT CONNECTOR 1A6P1, MEASURE RESISTANCE OF THE SOLENOID WINDING THROUGH THE HARNESS.

SOCKETS	LIMITS (Ω)	NOM (Ω)
35 & 45	21-45	30
34 & 46	21-45	30

SOCKET-TO-GROUND: >1 MEGOHM

ARE RESISTANCE MEASUREMENTS WITHIN LIMITS?

Yes → B (PG 2)

No → AT CONNECTOR 1P2, MEASURE RESISTANCE OF THE SOLENOID WINDING THROUGH THE HARNESS.

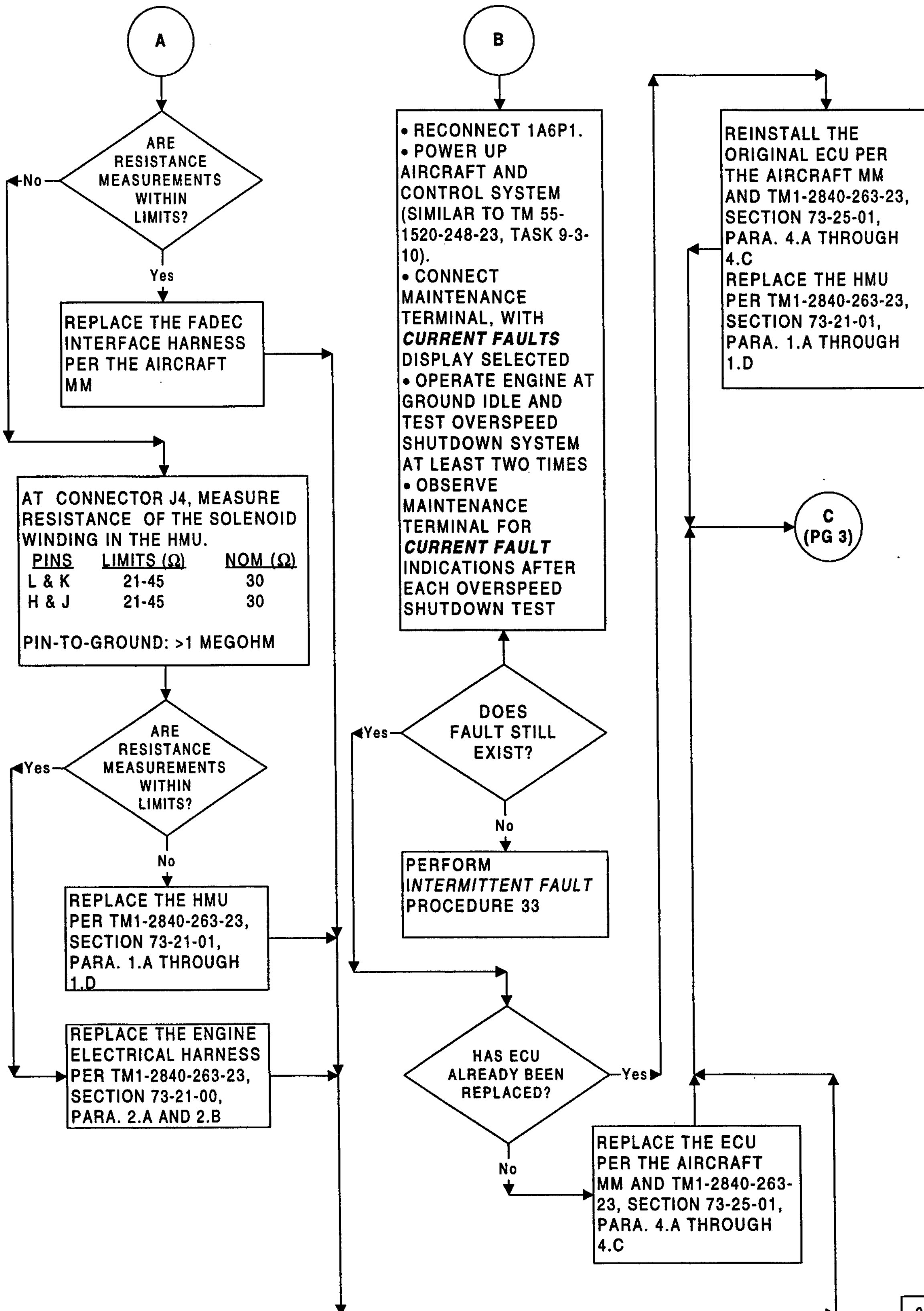
SOCKETS	LIMITS (Ω)	NOM (Ω)
H & M	21-45	30
N & b	21-45	30

SOCKET-TO-GROUND: >1 MEGOHM

→ A (PG 2)

21 AUG 1998

23. OVERSPEED SYSTEM ENGINE SHUTDOWN TEST FAULT



21 AUG 1998

23. OVERSPEED SYSTEM ENGINE SHUTDOWN TEST FAULT

C

VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10).
- CONNECT MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED
- OPERATE ENGINE AT GROUND IDLE AND TEST OVERSPEED SHUTDOWN SYSTEM
- REPEAT A SECOND TIME TO TEST THE ALTERNATE CHANNEL
- OBSERVE ***CURRENT FAULTS*** DISPLAY ON MAINTENANCE TERMINAL AFTER EACH OVERSPEED SHUTDOWN TEST TO VERIFY NO FAULTS INDICATED

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

21 AUG 1998

24. OVERSPEED SYSTEM N_P SPEED SIGNAL FAULT

ASSOCIATED FAULT INDICATION(S):
NpOSFlt

DESCRIPTION:

THE ECU INDICATES A PROBLEM WITH THE SPEED SIGNALS AS MEASURED BY THE OVERSPEED CIRCUITS IN THE ECU

POSSIBLE CAUSES:

- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- CONNECT MAINTENANCE TERMINAL, AND DETERMINE ***CURRENT FAULTS*** AND ***LAST ENGINE RUN FAULTS***

THE FOLLOWING FAULT CODES ARE NOT RELATED TO THE FAULT COVERED BY THIS TASK:

Np1Flt, Np2Flt, Np12Flt

ARE ANY (OR ALL) OF THESE CODES SHOWN?

Yes → PERFORM TASK 8

No → REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C

VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10).
- CONNECT MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED
- OPERATE ENGINE AT GROUND IDLE AND TEST OVERSPEED SHUTDOWN SYSTEM
- REPEAT A SECOND TIME TO TEST THE ALTERNATE CHANNEL
- OBSERVE ***CURRENT FAULTS*** DISPLAY ON MAINTENANCE TERMINAL AFTER EACH OVERSPEED SHUTDOWN TEST TO VERIFY NO FAULTS INDICATED

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

21 AUG 1998

25. WATCHDOG TIMER HARD FAULT

ASSOCIATED FAULT INDICATION(S):
WDTTimeOut

DESCRIPTION:

WATCHDOG TIMER TRIPPED

POSSIBLE CAUSES:

- ECU FAILURE (SOFTWARE EXECUTION CYCLE NOT PROPERLY COMPLETED)

PROCEED AS FOLLOWS TO RESOLVE:

REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)

VERIFICATION PROCEDURE:

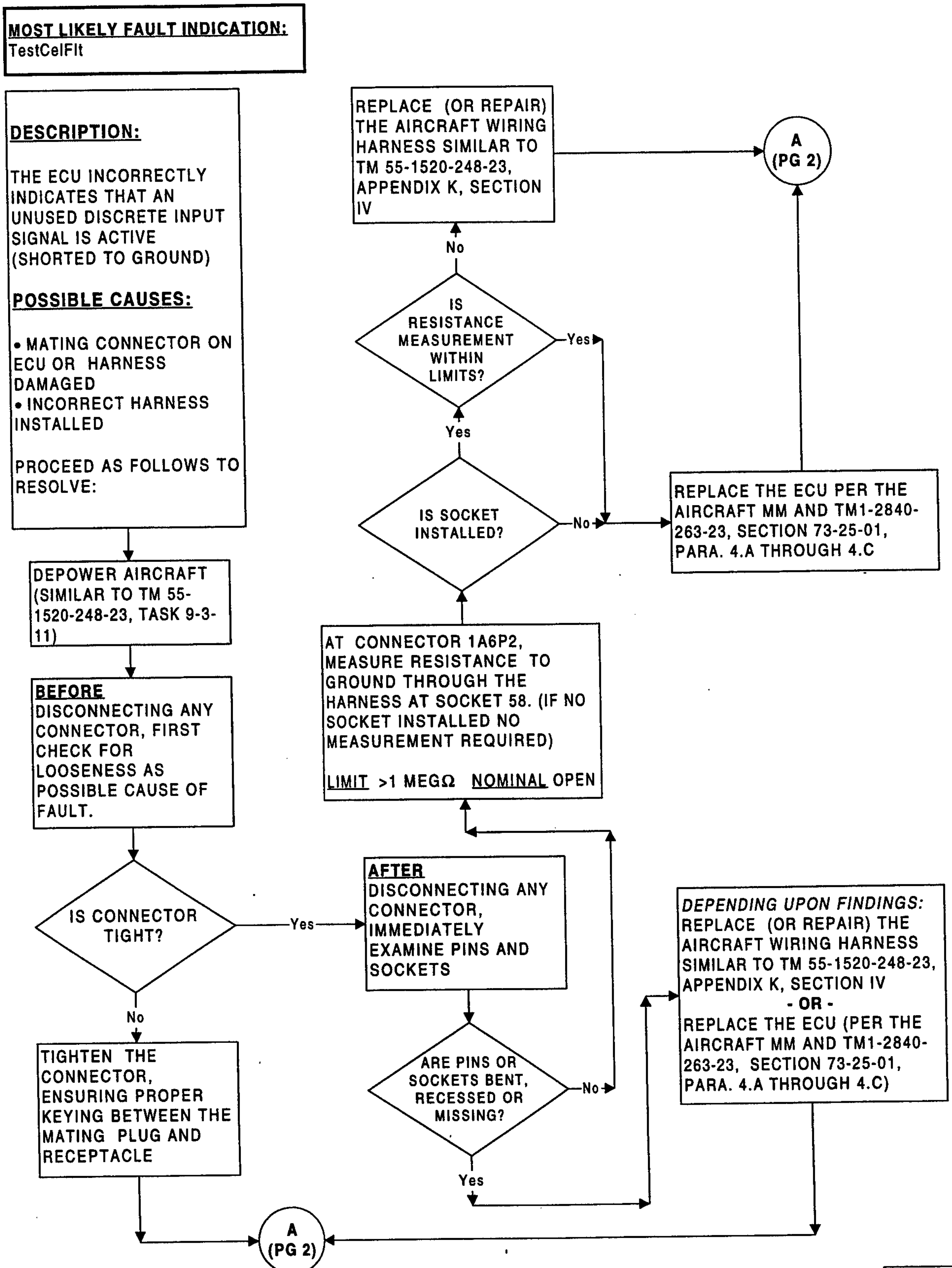
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10).
- CONNECT MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED
- CYCLE FADEC POWER OFF AND ON (CIRCUIT BREAKER 1CB15)
- START ENGINE AND OPERATE AT 100% Np WITH FLAT PITCH ROTOR
- OBSERVE MAINTENANCE TERMINAL AND VERIFY NO *CURRENT FAULTS* INDICATED

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

21 AUG 1998

26. UNUSED DISCRETE INPUT FAULT



21 AUG 1998

26. UNUSED DISCRETE INPUT FAULT

A

VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- CONNECT MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED, AND CYCLE **FADEC** POWER OFF AND ON (FADEC CIRCUIT BREAKER 1CB15)
- VERIFY NO ***CURRENT FAULTS*** SHOWING

↓

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

↓

RETURN TO SERVICE

21 AUG 1998

27. INCORRECT MAINTENANCE MESSAGE CODES

ASSOCIATED FAULT INDICATION(S):
ARINCFltAn, CPDFlt, FTempFlt, LoadSelFlt, LoadSHdFlt, NgOFlt, NgORgFlt, NgORtFlt, Not Used, NrDFlt, P1DFlt,

DESCRIPTION:

THE ECU INDICATES FAULT CODES THAT ARE NOT VALID FOR THIS INSTALLATION

POSSIBLE CAUSES:

- INSTALLED ECU IS NOT CORRECT CONFIGURATION
- MAINTENANCE TERMINAL DATA FILES CORRUPTED OR WRONG CONFIGURATION
- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

CHECK PART NUMBER OF INSTALLED ECU TO VERIFY IT IS CORRECT

IS ECU PART NUMBER CORRECT?

No → REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C → VERIFICATION PROCEDURE

Yes →

- RELOAD MAINTENANCE TERMINAL DATA FILES INTO MAINTENANCE TERMINAL USING KNOWN GOOD DISKS
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10).
- CONNECT MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED
- CYCLE FADEC POWER OFF AND ON (**FADEC** CIRCUIT BREAKER 1CB15)

DO INCORRECT FAULTS STILL EXIST?

Yes → REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C

No → PROBLEM RESOLVED - **RETURN TO SERVICE**

VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10).
- CONNECT MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED
- CYCLE FADEC POWER OFF AND ON (**FADEC** CIRCUIT BREAKER 1CB15)
- OBSERVE MAINTENANCE TERMINAL AND VERIFY NO *CURRENT FAULTS* INDICATED

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

21 AUG 1998

28. SECONDARY FAULT CODES

ASSOCIATED FAULT INDICATION(S):
AMFlt, HardFlt, Or28Flt, Or28RgFlt, OSFlt, TempFlt, WfHdFlt,

DESCRIPTION:

A SECONDARY FAULT CODE IS BEING INDICATED BY THE ECU, WHICH IS NORMALLY GENERATED AS A RESULT OF OTHER EXISTING FAULT CODES

POSSIBLE CAUSES:

- OTHER FADEC SYSTEM FAULTS HAVE OCCURRED

PROCEED AS FOLLOWS TO RESOLVE:

PERFORM ALL OTHER MAINTENANCE TASKS ASSOCIATED WITH THE OTHER DISPLAYED FAULT CODES

VERIFICATION PROCEDURE:

- PERFORM VERIFICATION PROCEDURES SPECIFIED FOR THE OTHER FAULT CODES DISPLAYED.
- CONNECT MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED
- OBSERVE MAINTENANCE TERMINAL AND VERIFY NO *CURRENT FAULTS* INDICATED

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

21 AUG 1998

29. ENGINE LIMITS EXCEEDED

ASSOCIATED FAULT INDICATION(S):
MGTLmTOut, MGTRLmTOut, MGTSLmTOut, MGTSRLmTOut, NgLmTOut, NgRLmTOut, NpLmTOut, NpQExLmAdv, NpQRnLmAdv, OSFlag, QLmTOut, QRLmTOut,

DESCRIPTION:

THE ECU INDICATES THAT ENGINE PERFORMANCE LIMITS HAVE BEEN EXCEEDED

POSSIBLE CAUSES:

- ENGINE OPERATIONAL PROBLEM
- AIRCRAFT OPERATIONAL PROBLEM

PROCEED AS FOLLOWS TO RESOLVE:

- USING MAINTENANCE TERMINAL, DOWNLOAD *ENGINE MAINTENANCE HISTORY* FROM ECU.
- REVIEW MAGNITUDE AND DURATION OF EXCEEDENCES
- COMPARE EXCEEDENCE VALUES FROM MAINTENANCE TERMINAL WITH THOSE REGISTERED BY THE COCKPIT MULTI-FUNCTION DISPLAY (UPON WHICH ENGINE MAINTENANCE DECISIONS ARE BASED)

DOES MFD SHOW LIMITS EXCEEDENCES?

Yes →

- PERFORM MAINTENANCE ACTIONS INDICATED BY MFD-RECORDED EXCEEDENCE VALUES, IN ACCORDANCE WITH TM1-2840-263-23
- DOCUMENT ACTIONS AND CLEAR MFD ENGINE HISTORY PER EXISTING PROCEDURES

No →

MAINT TERMINAL GENERALLY AGREE WITH MFD?

No →

- SELECT ***REAL TIME DATA DISPLAY*** ON MAINTENANCE TERMINAL
- START ENGINE AND OPERATE AT 100% Np AT LIGHT ON SKIDS POWER. COMPARE READINGS OF Np, Ng, MGT, AND TORQUE BETWEEN THE MAINTENANCE TERMINAL AND THE COCKPIT GAGES.
- IN THE EVENT OF DISAGREEMENT, RESOLVE DIFFERENCES IN ACCORDANCE WITH TM1-2840-263-23, CHAPTER 72-00-00, TABLE 101, AND RELATED SUPPLEMENTARY TROUBLESHOOTING SEQUENCES.

Yes →

VERIFICATION PROCEDURE:

- VERIFY THAT LIMITS EXCEEDENCE INFORMATION HAS BEEN REVIEWED AND APPROPRIATE MAINTENANCE ACTIONS TAKEN, PRIOR TO RUNNING THE ENGINE.
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- CYCLE FADEC POWER OFF AND ON (**FADEC** CIRCUIT BREAKER 1CB15)
- CONNECT MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED
- START ENGINE AND OPERATE AT 100% Np WITH FLAT PITCH ROTOR
- OBSERVE MAINTENANCE TERMINAL AND VERIFY NO ***CURRENT FAULTS*** INDICATED

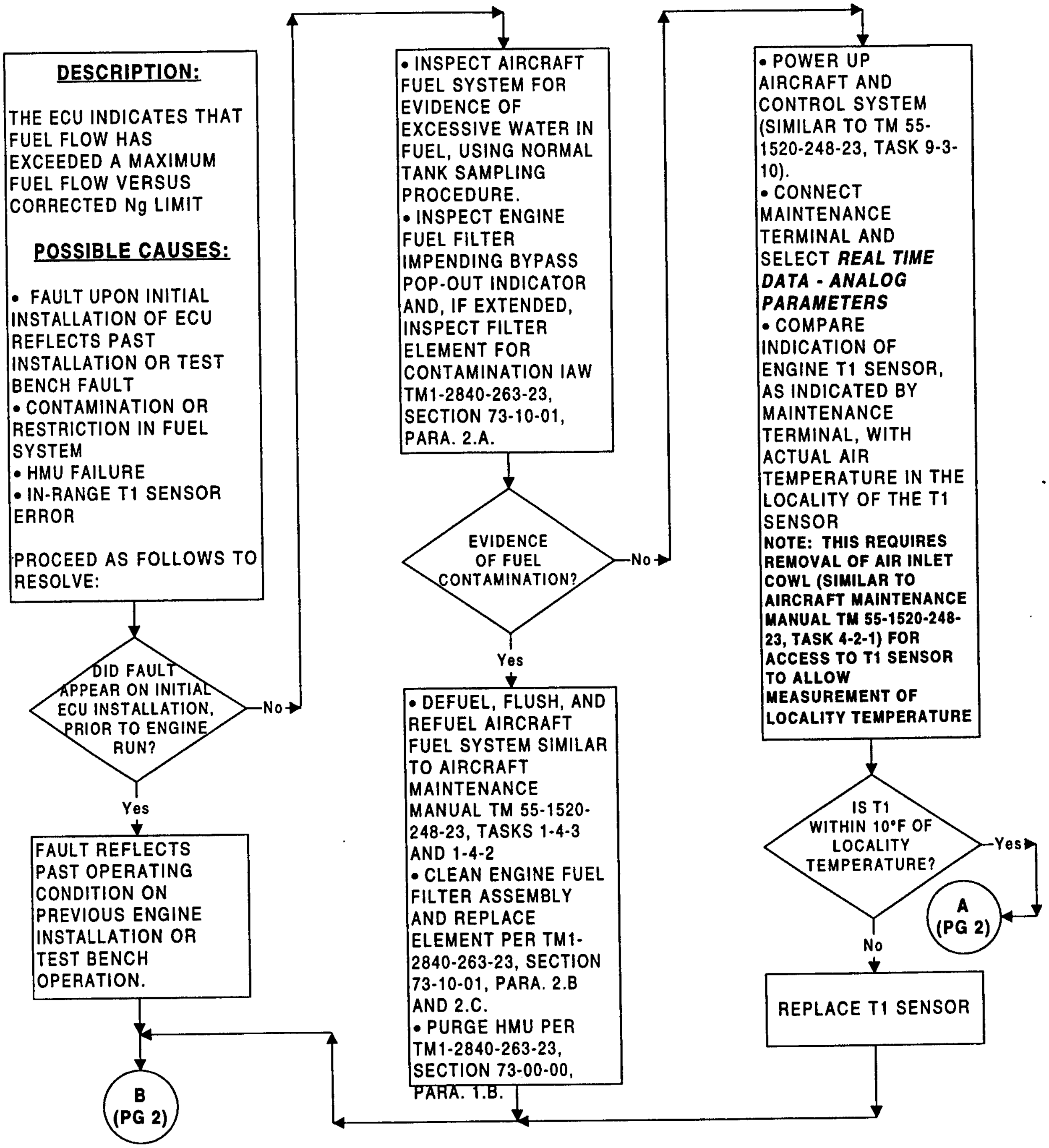
PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

21 AUG 98

30. FUEL FLOW LIMIT EXCEEDED

ASSOCIATED FAULT INDICATION(S):
WfLimFlag



21 AUG 1998

30. FUEL FLOW LIMIT EXCEEDED

A

REPLACE THE HMU PER TM1-2840-263-23, SECTION 73-21-01, PARA. 1.A THROUGH 1.D

B

VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10).
- CONNECT MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED
- OPERATE ENGINE AT 100% Np, WITH FLAT ROTOR PITCH AND AT LIGHT-ON-SKIDS POWER
- OBSERVE MAINTENANCE TERMINAL AND VERIFY NO *CURRENT FAULTS* INDICATED

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

21 JUN 1998

31. ROTOR SPEED TRIM "BEEPER" SWITCH CIRCUIT FAULT

ASSOCIATED FAULT INDICATION(S):
BeepFlt

DESCRIPTION:

THE ECU INDICATES A PROBLEM WITH THE ECU/ ROTOR SPEED TRIM "BEEPER" SWITCH CIRCUIT

POSSIBLE CAUSES:

- MATING CONNECTORS ON ECU, AIRCRAFT HARNESS, OR BEEPER SWITCH LOOSE OR DAMAGED
- ROTOR SPEED BEEPER SWITCH FAILURE
- ECU FAILURE
- AIRCRAFT HARNESS FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT?

No → TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE → C (PG 2)

Yes → **AFTER** DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING?

Yes → *DEPENDING UPON FINDINGS:* REPLACE (OR REPAIR) THE AIRCRAFT WIRING HARNESS, OR THE ROTOR SPEED BEEPER SWITCH, SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV
- OR -
REPLACE THE ECU (PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C) → C (PG 2)

No → AT CONNECTOR 1A6P2, MEASURE SWITCH RESISTANCE TO GROUND THROUGH HARNESS

SWITCH POS	SOCKET	LIMITS (Ω)
NO BEEP	38	> 100K
NO BEEP	41	> 100K
BEEP UP	38	<1
BEEP UP	41	> 100K
BEEP DOWN	38	> 100K
BEEP DOWN	41	<1

ARE MEASUREMENTS WITHIN LIMITS?

Yes → A (PG 2)

No → AT CONNECTOR 4A2J1, MEASURE SWITCH RESISTANCE ACROSS PINS AT THE SWITCH

SWITCH POS.	PINS	LIMITS (Ω)
NO BEEP	4 & 5	> 100K
NO BEEP	6 & 5	> 100K
BEEP UP	4 & 5	<1
BEEP UP	6 & 5	> 100K
BEEP DOWN	4 & 5	> 100K
BEEP DOWN	6 & 5	<1

ARE MEASUREMENTS WITHIN LIMITS?

Yes → B (PG 2)

No → REPLACE THE ROTOR SPEED BEEPER SWITCH ASSEMBLY (4A2) SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV → C (PG 2)

21 AUG 1998

31. ROTOR SPEED TRIM "BEEPER" SWITCH CIRCUIT FAULT

A

- REATTACH CONNECTOR 1A6P2 TO ECU.
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- CONNECT MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED
- BEEP UP THEN DOWN THEN UP (BE SURE BEEP SWITCH IS DEPRESSED FOR LESS THAN 20 SECONDS)

DOES FAULT STILL EXIST?

No → PERFORM *INTERMITTENT FAULT* PROCEDURE (TASK 33)

Yes → REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C → C

B

REPLACE (OR REPAIR) THE AIRCRAFT WIRING HARNESS, SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV → C

C

VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- USE MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED
- BEEP UP THEN DOWN THEN UP (BE SURE BEEP SWITCH IS DEPRESSED FOR LESS THAN 20 SECONDS)
- VERIFY THAT THE FAULT IS NO LONGER INDICATED.
- START ENGINE AND OPERATE AT 100% Np.
- BEEP UP AND DOWN AND VERIFY THAT Np SHOWS PROPER RESPONSE

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

21 AUG 1998

32. ROTOR SPEED TRIM "BEEPER" SWITCH STUCK

ASSOCIATED FAULT INDICATION(S):
BpStuckFlt

DESCRIPTION:

THE ECU INDICATES A PROBLEM WITH THE ECU/ ROTOR SPEED TRIM "BEEPER" SWITCH CIRCUIT

POSSIBLE CAUSES:

- MATING CONNECTORS ON ECU, AIRCRAFT HARNESS, OR BEEPER SWITCH LOOSE OR DAMAGED
- ROTOR SPEED BEEPER SWITCH FAILURE
- ECU FAILURE
- AIRCRAFT HARNESS FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT?

No → TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE → C (PG 2)

Yes →

AFTER DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING?

Yes → *DEPENDING UPON FINDINGS:* REPLACE (OR REPAIR) THE AIRCRAFT WIRING HARNESS, OR THE ROTOR SPEED BEEPER SWITCH, SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV

- OR -

REPLACE THE ECU (PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C) → C (PG 2)

No →

AT CONNECTOR 1A6P2, MEASURE SWITCH RESISTANCE TO GROUND THROUGH HARNESS

SWITCH POS	SOCKET	LIMITS (Ω)
NO BEEP	38	> 100K
NO BEEP	41	> 100K

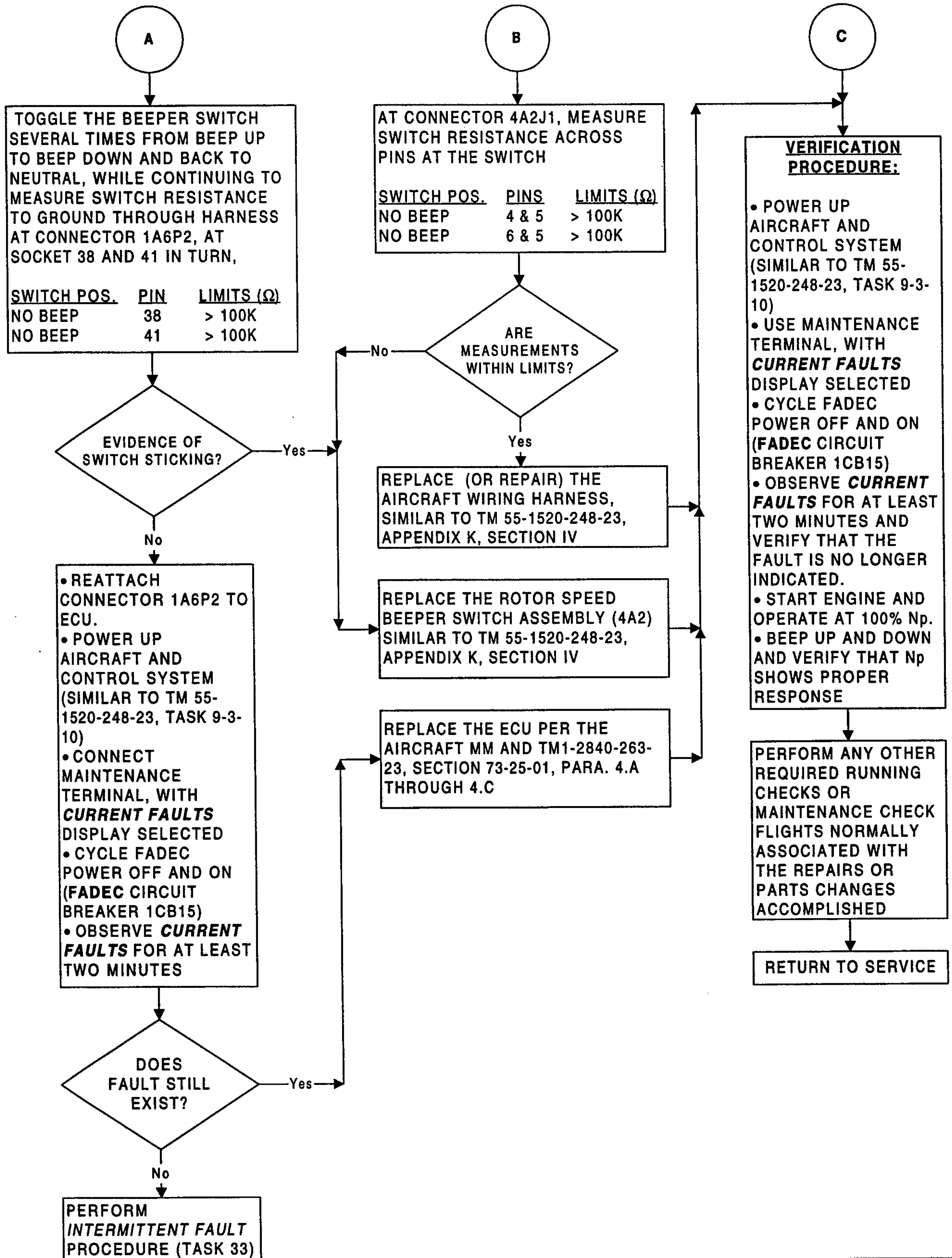
ARE MEASUREMENTS WITHIN LIMITS?

Yes → A (Pg 2)

No → B (Pg 2)

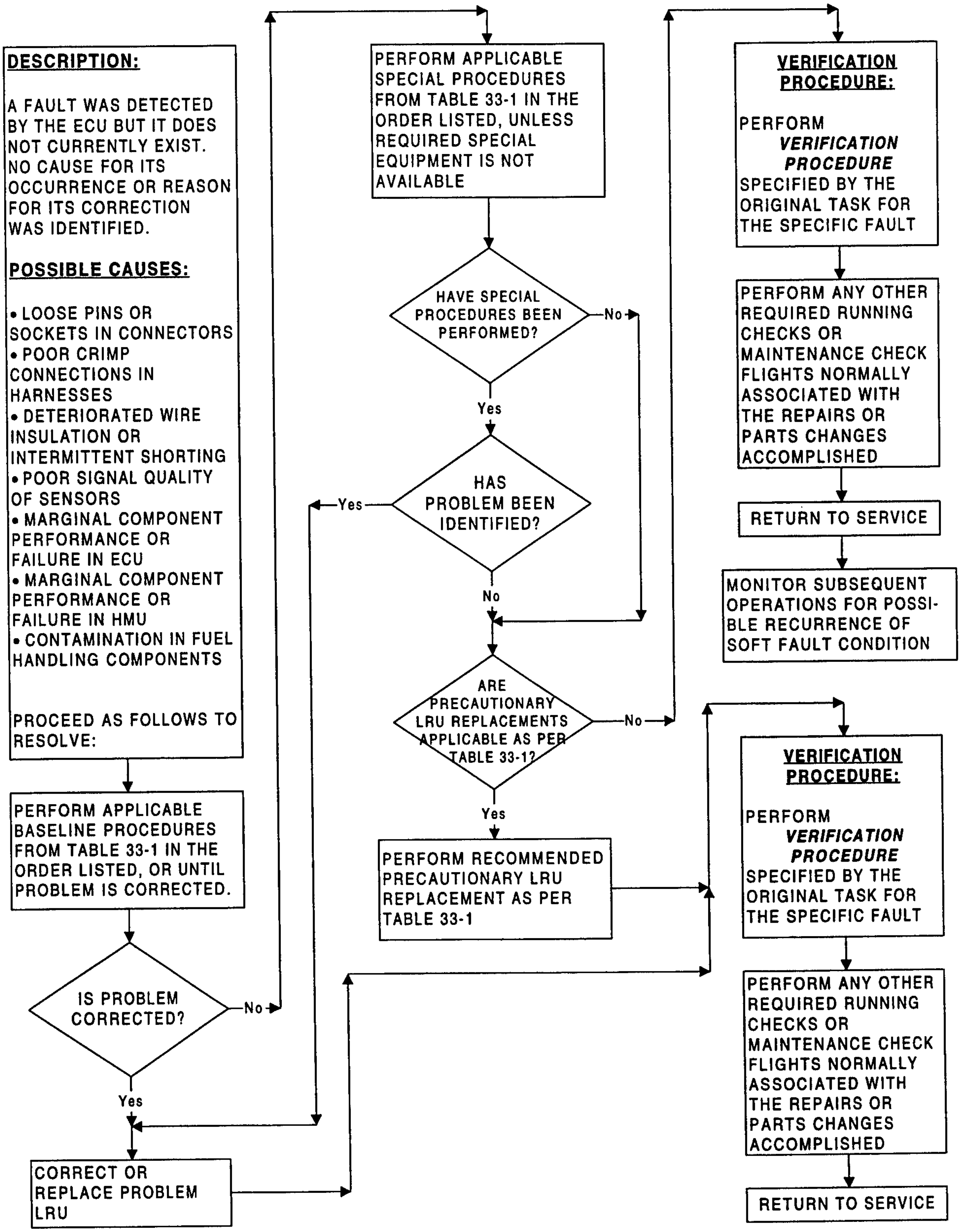
21 AUG 1998

32. ROTOR SPEED TRIM "BEEPER" SWITCH STUCK



21 AUG 1998

33. INTERMITTENT FAULT PROCEDURE



09 SEP 1998

TASK	BASELINE PROCEDURE	SPECIAL PROCEDURE	PRECAUTIONARY LRU REPLACEMENT*
1	1	2	1, 2, 3, 7
2	1	2	
3	1		1, 2, 3, 7
4	1	2	
5	1	2, 3	2, 3, 7, 1
6	4A, 1	2, 3	2, 3, 7, 1
7	4C, 1	2, 3	4, 1, 3, 7
8	1	2, 4C	5, 3, 7, 1
9	1	2, 4C	6, 3, 7, 1
10	1	2, 4C	
11	1	2, 4E	
12	1	2, 4C	
13	4B, 1	2	
14	1	2, 4D	
17	1	2, 4F	
18	1	2	
19	1	2	9, 1, 8
20	1	2	
21	1	2, 4D	2, 3, 7
23	1	2	
24	1	2, 4C	
31	1	2	
32	1	2	

***LRU IDENTIFICATION**

1. Electronic Control Unit (ECU)
2. Hydromechanical Unit (HMU)
3. Engine Harness
4. T1 (CIT) Sensor
5. Np Sensor
6. Ng Sensor
7. Engine Interface Harness (Connects to ECU 1A6J1 connector)
8. Aircraft Harness (connects to ECU 1A6J2 connector
9. FADEC Auto/Manual Switch

TABLE 33-1

BASELINE AND SPECIAL FAULT PROCEDURES:

1. **COMPREHENSIVE HARNESS AND CONNECTOR CHECK**
   Repeat all circuit resistance and insulation resistance checks listed in the original task for the fault being investigated, including those checks omitted in following the logical sequence of task steps. Insulation resistance should be checked between the circuit and ground, and between the circuit and other pins. Flex the harnesses if possible while making resistance measurements to detect intermittent shorts/opens. Concurrently, check for connector looseness, damaged pins or recessed sockets as possible cause of fault at every connection listed in the original task

2. **CONNECTOR SOCKET RETENTION CHECK**
   Perform socket retention check specified by ***Bell AMM*** procedure at all applicable interface harness or airframe harness connection points identified in the original task for the fault being investigated.

NOTE TO REVIEWER: BHT CONNECTOR SOCKET RETENTION CHECK PROCEDURE MUST BE TRANSCRIBED FROM 407 MAINTENANCE MANUAL AND INSERTED HERE.

09 SEP 1998

BASELINE AND SPECIAL FAULT PROCEDURES (Cont.)

THIS SECTION MUST AGREE WITH AS YET UNWRITTEN SECTION OF 73-25-XX

WARNING: FOLLOW APPROPRIATE SAFETY PRACTICES TO AVOID PERSONAL INJURY/SHOCK FROM THE HIGH VOLTAGE TEST.

CAUTION: ALL CONNECTIONS OF THE PARTICULAR HARNESS MUST BE DISCONNECTED PRIOR TO PERFORMING THE 100-VOLT INSULATION RESISTANCE CHECK TO AVOID POTENTIAL DAMAGE TO COMPONENTS.

3. XXX-VOLT INSULATION RESISTANCE CHECK

~~Perform a 100-volt insulation resistance check for the engine harness, interface harness, or airframe harness at pins/sockets applicable per the original task for the fault being investigated. *Consult applicable engine manufacturer or airframe manufacturer* 100-volt insulation resistance test procedures for the particular harness being tested.~~

4. MAINTENANCE TERMINAL SIGNAL MONITORING CHECKS

A. With engine shut down, move throttle hard against first the minimum and then the maximum stop. Monitor signals listed in Table 33-2 for the task associated with the fault code, against the fault range limits listed in Table 33-2. Replace HMU if PLA signal exceeds the normal range of 0° to 100° by more than 2°, or if signal quality indicates probability of fault limit exceedence.

B. Move collective pitch lever hard against the minimum stop. Monitor signals listed in Table 33-2 for the task associated with the fault code, against the fault range limits listed in Table 33-2. Readjust or replace collective pitch potentiometer if signal is not 0±5% when at the minimum stop.

C. Run engine at ground idle and monitor signals listed in Table 33-2 for the task associated with the fault code. Check signal quality considering whether signal could be exceeding rate or range fault limits listed in Table 33-2, or if value of signal is unreasonable for operating condition. Flex harnesses carrying signal (being careful to avoid damaging harness and using caution to avoid personal contact with rotating or hot components), if possible while monitoring signal, to determine if intermittent signal change is evident with harness flexing. If poor signal quality is suspected, replace LRU which is the source of the signal and recheck signal quality. If intermittent is evident by flexing harness, replace suspect harness.

D. Same as C, except run engine at 100% Np,

E. Run engine at 85% Np, flat pitch rotor, with airframe electrical power to ECU turned **OFF** (breaker 1CB15 pulled).

CAUTION: REVERSION TO MANUAL MODE POSSIBLE DURING THIS PROCEDURE

Monitor signals listed in Table 33-2 for the task associated with the fault code. Flex harnesses carrying signal (being careful to avoid damaging harness and using caution to avoid personal contact with rotating of hot components), if possible while monitoring signal, to determine if intermittent signal change is evident with harness flexing. Replace PMA if signal is within 0.5 volts of fault limits, or if ECU loses power. If intermittent is evident by flexing harness, replace suspect harness.

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BASELINE AND SPECIAL FAULT PROCEDURES (Cont.)

4. MAINTENANCE TERMINAL SIGNAL MONITORING CHECKS (Cont.)

F. With engine shut down and power being supplied by battery, monitor signals listed in Table 33-2 for the task associated with the fault code, against limits of Table 33-2. Apply electrical loads representative of conditions in flight and verify limits of Table 33-2 are not exceeded. If conditions are exceeded, troubleshoot aircraft battery or electrical system. Flex harnesses carrying signal (being careful to avoid damaging harness), if possible while monitoring signal, to determine if intermittent signal change is evident with harness flexing. If intermittent is evident by flexing harness, replace suspect harness.

TASK	SIGNAL	RANGE LIMIT	RATE-OF-CHANGE LIMIT	DIFFERENCE LIMIT
5	WfmvRaw	-121.7 pph to 568.0 pph	962.5 pph/sec	
6	PLA1Raw	-5° to 110°		IPLA1Raw -PLA2RawI < 5°
	PLA2Raw	-5° to 110°		
	PLARfRaw	4.95 to 5.05 volts		
7	T1ARaw	-75°F to 225°F	200°F/sec	IT1ARaw - T1BRawI < 30°F
	T1BRaw	-75°F to 225°F	200°F/sec	
8	Np1Raw	20% to 160% (Ng > 71%)	400%/sec	INp1Raw - Np2RawI < 5%
	Np2Raw	20% to 160% (Ng > 71%)	400%/sec	
9	Ng1Raw	8% to 130% (Engine Running)	375%/sec	INg1Raw - Ng2RawI < 5%
	Ng2Raw	8% to 130% (Engine Running)	375%/sec	
10	MGTRaw	-77°F to 2400°F	2000°F	
11	AI28Raw	8.5 to 60 volts		
	AltRipRaw (Ripple)	< 3.0 volts		
12	QRaw (100% = 524 ft-lbs)	-10% to 200% (Normal Limits) [5% to 200% (if Ng > 85%, not Decelerating)]	1500%/sec	
13	CPRaw (100% = Full Up)	-14.4% to 110%		
14	NrRaw	40% to 150% (Ng > 71%)	400%/sec	
15	P1Raw	5.0 psia to 16.0 psia	40 psi/sec	
17	AF28Raw	8.5 to 35.0 volts		
21	WfStp	-121.7 pph to 568.0 pph		IWfStp - WfmvRawI < 42 pph
	WfmvRaw	-121.7 pph to 568.0 pph		
22	WfmvRaw	< 13 to 16 pph Prior to Start		
24	NpA1Raw NpA2Raw NpA3Raw NpA4Raw			INpA1Raw - NpI < 2.5% INpA2Raw - NpI < 2.5% INpA3Raw - NpI < 2.5% INpA4Raw - NpI < 2.5%
	Np			

TABLE 33-2

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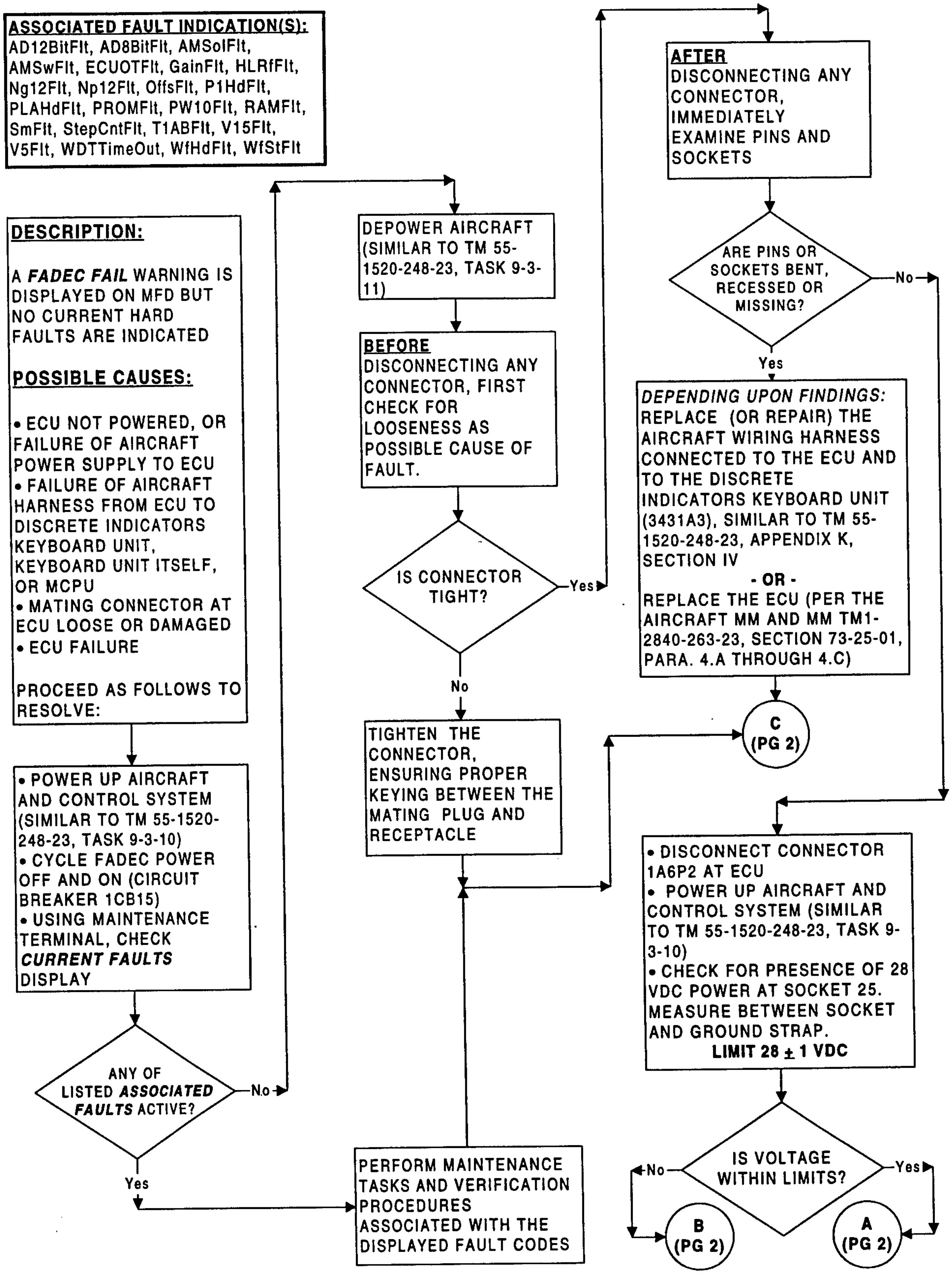
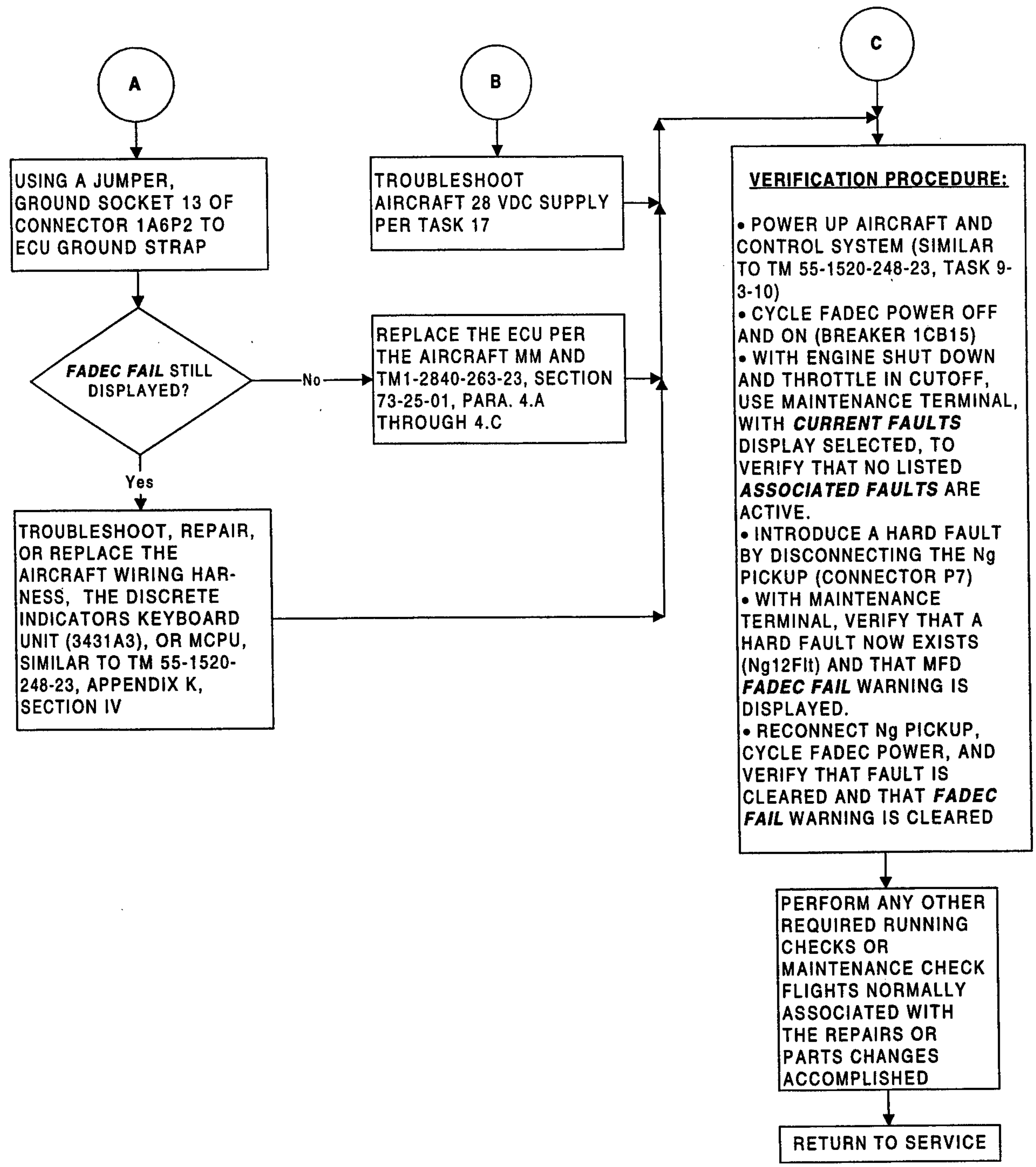
34. *FADEC FAIL* WARNING (MFD) INCORRECTLY "ON"



25 AUG 1998

34. *FADEC FAIL* WARNING (MFD) INCORRECTLY "ON"



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35. ***FADEC FAIL*** WARNING (MFD) INCORRECTLY "OFF"

ASSOCIATED FAULT INDICATION(S):
AD12BitFlt, AD8BitFlt, AMSolFlt, AMSwFlt, ECUOTFlt, GainFlt, HLRfFlt, Ng12Flt, Np12Flt, OffsFlt, P1HdFlt, PLAHdFlt, PROMFlt, PW10Flt, RAMFlt, SmFlt, StepCntFlt, T1ABFlt, V15Flt, V5Flt, WDTTimeOut, WfHdFlt, WfStFlt

DESCRIPTION:

A ***FADEC FAIL*** WARNING IS NOT DISPLAYED ON MFD WHEN CURRENT HARD FAULTS EXIST

POSSIBLE CAUSES:

- FAILURE OF AIRCRAFT HARNESS FROM ECU TO DISCRETE INDICATORS KEYBOARD UNIT, KEYBOARD UNIT ITSELF, OR MCPU
- MATING CONNECTOR AT ECU DAMAGED
- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- CYCLE FADEC POWER OFF AND ON (CIRCUIT BREAKER 1CB15)
- USING MAINTENANCE TERMINAL, CHECK ***CURRENT FAULTS*** DISPLAY

ANY OF LISTED ***ASSOCIATED FAULTS*** ACTIVE?

No: MFD IS CORRECTLY REPORTING CURRENT STATUS → C (PG 2)

Yes: DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT?

No: TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE → C (PG 2)

Yes: **AFTER** DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING?

Yes: ~~*DEPENDING UPON FINDINGS:*~~
REPLACE (OR REPAIR) THE AIRCRAFT WIRING HARNESS CONNECTED TO THE ECU AND TO THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV

- OR -

REPLACE THE ECU (PER THE AIRCRAFT MM AND MM TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C) → C (PG 2)

No:
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- DISCONNECT CONNECTOR 1A6P2

IS ***FADEC FAIL*** DISPLAYED?

Yes → A (PG 2)

No → B (PG 2)

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35. ***FADEC FAIL*** WARNING (MFD) INCORRECTLY "OFF"

A

REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- CYCLE FADEC POWER OFF AND ON (CIRCUIT BREAKER 1CB15)
- USING MAINTENANCE TERMINAL, CHECK ***CURRENT FAULTS*** DISPLAY

ANY FAULT CODES DISPLAYED?

No

Yes

PERFORM MAINTENANCE TASKS AND VERIFICATION PROCEDURES ASSOCIATED WITH THE DISPLAYED FAULT CODES

B

TROUBLESHOOT, REPAIR, OR REPLACE THE AIRCRAFT WIRING HARNESS, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), OR MCPU, SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV

C

VERIFICATION PROCEDURE:

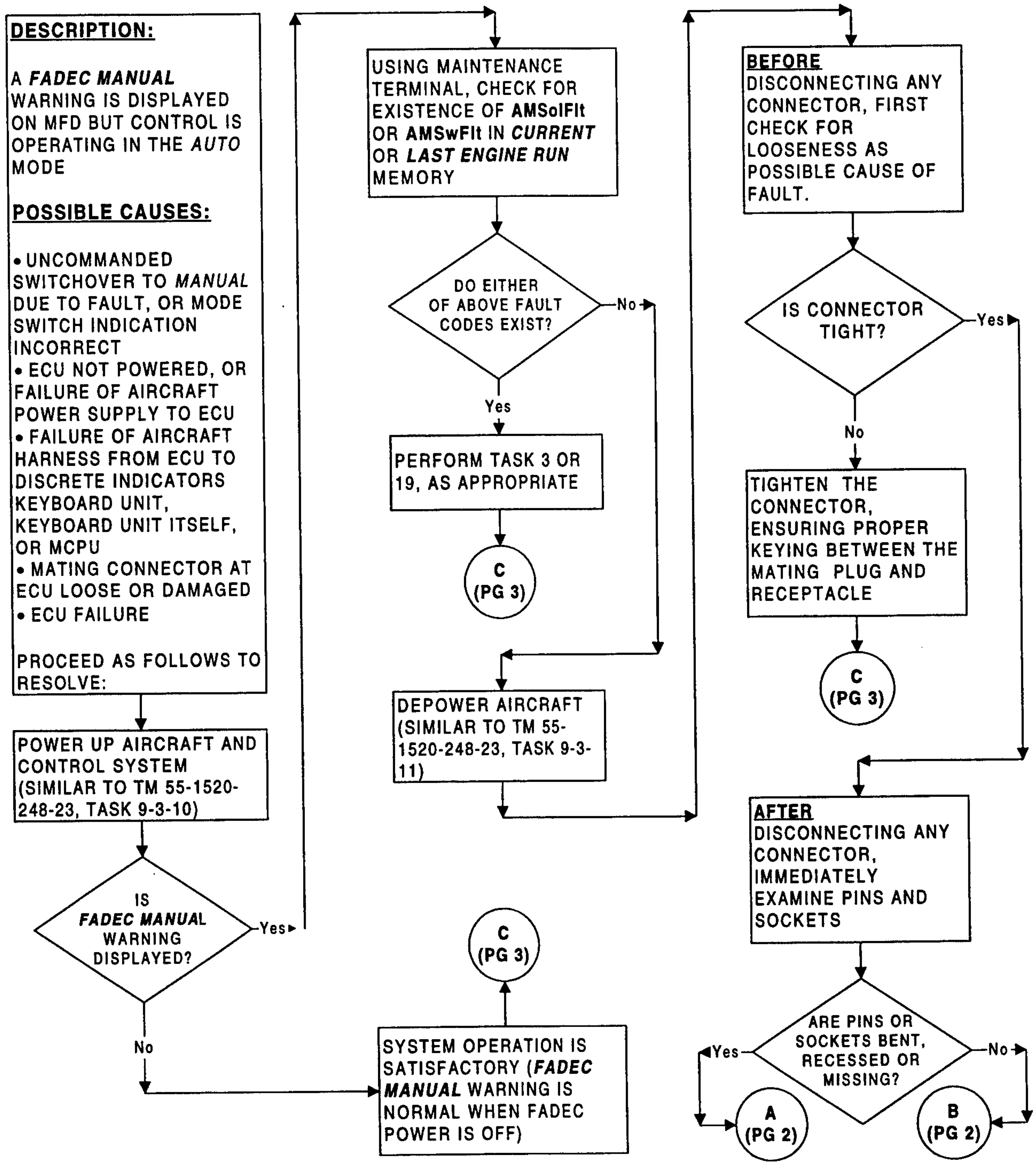
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- CYCLE FADEC POWER OFF AND ON (BREAKER 1CB15)
- WITH ENGINE SHUT DOWN AND THROTTLE IN CUTOFF, USE MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED, TO VERIFY THAT NO LISTED ***ASSOCIATED FAULTS*** ARE ACTIVE.
- INTRODUCE A HARD FAULT BY DISCONNECTING THE Ng PICKUP (CONNECTOR P7)
- WITH MAINTENANCE TERMINAL, VERIFY THAT A HARD FAULT NOW EXISTS (Ng12Flt) AND THAT MFD ***FADEC FAIL*** WARNING IS DISPLAYED.
- RECONNECT Ng PICKUP, CYCLE FADEC POWER, AND VERIFY THAT FAULT IS CLEARED AND THAT ***FADEC FAIL*** WARNING IS CLEARED

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

25 AUG 1998

36. *FADEC MANUAL* WARNING (MFD) INCORRECTLY "ON"



25 AUG 1998

A

DEPENDING UPON FINDINGS:
REPLACE (OR REPAIR) THE AIRCRAFT WIRING HARNESS CONNECTED TO THE ECU AND TO THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV

- OR -

REPLACE THE ECU (PER THE AIRCRAFT MM AND MM TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)

C (PG 3)

B

- DISCONNECT CONNECTOR 1A6P2 AT ECU
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- CHECK FOR PRESENCE OF 28 VDC POWER AT SOCKET 25. MEASURE BETWEEN SOCKET AND GROUND STRAP.

LIMIT 28 ± 1 VDC

IS VOLTAGE WITHIN LIMITS?

Yes

No

TROUBLESHOOT AIRCRAFT 28 VDC SUPPLY PER TASK 17

C (PG 3)

- TURN OFF POWER TO ECU (BREAKER 1CB15) BUT LEAVE REMAINING AIRCRAFT POWER *ON.*
- USING A JUMPER, GROUND SOCKET 23 OF CONNECTOR 1A6P2 TO ECU GROUND STRAP

IS *FADEC MANUAL* WARNING DISPLAYED?

No

Yes

TROUBLESHOOT, REPAIR, OR REPLACE THE AIRCRAFT WIRING HARNESS, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), OR MCPU, SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV

C (PG 3)

- DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)
- RECONNECT ALL CONNECTORS
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- USING MAINTENANCE TERMINAL, MONITOR **ManSel** AND **AutoSel** PARAMETERS WHILE TOGGLING AUTO/MANUAL SWITCH

PROPER OPERATION IS:
IF AUTO/MANUAL SWITCH IS SET TO AUTO,
AutoSel = ON
-AND-
IF AUTO/MANUAL SWITCH IS SET TO MANUAL,
ManSel = ON

IS AUTO/MANUAL SWITCH OPERATION OK?

Yes

No

TROUBLESHOOT FADEC MODE SWITCH CIRCUIT PER TASK 19 AND/OR SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV

USING MAINTENANCE TERMINAL, MONITOR **ManSel** AND **AutoSel** WHILE TOGGLING WITH AUTO/MANUAL SWITCH

WHEN **ManSel** = ***ON***, MFD ***FADEC MANUAL*** WARNING SHOULD BE DISPLAYED, AND WHEN **AutoSel** = ***ON***, MFD ***FADEC MANUAL*** WARNING SHOULD NOT BE DISPLAYED

DOES MFD DISPLAY AGREE WITH SWITCH POSITION?

Yes

No

REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C

C (PG 3)

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36. *FADEC MANUAL* WARNING (MFD) INCORRECTLY "ON"

C

VERIFICATION PROCEDURE:

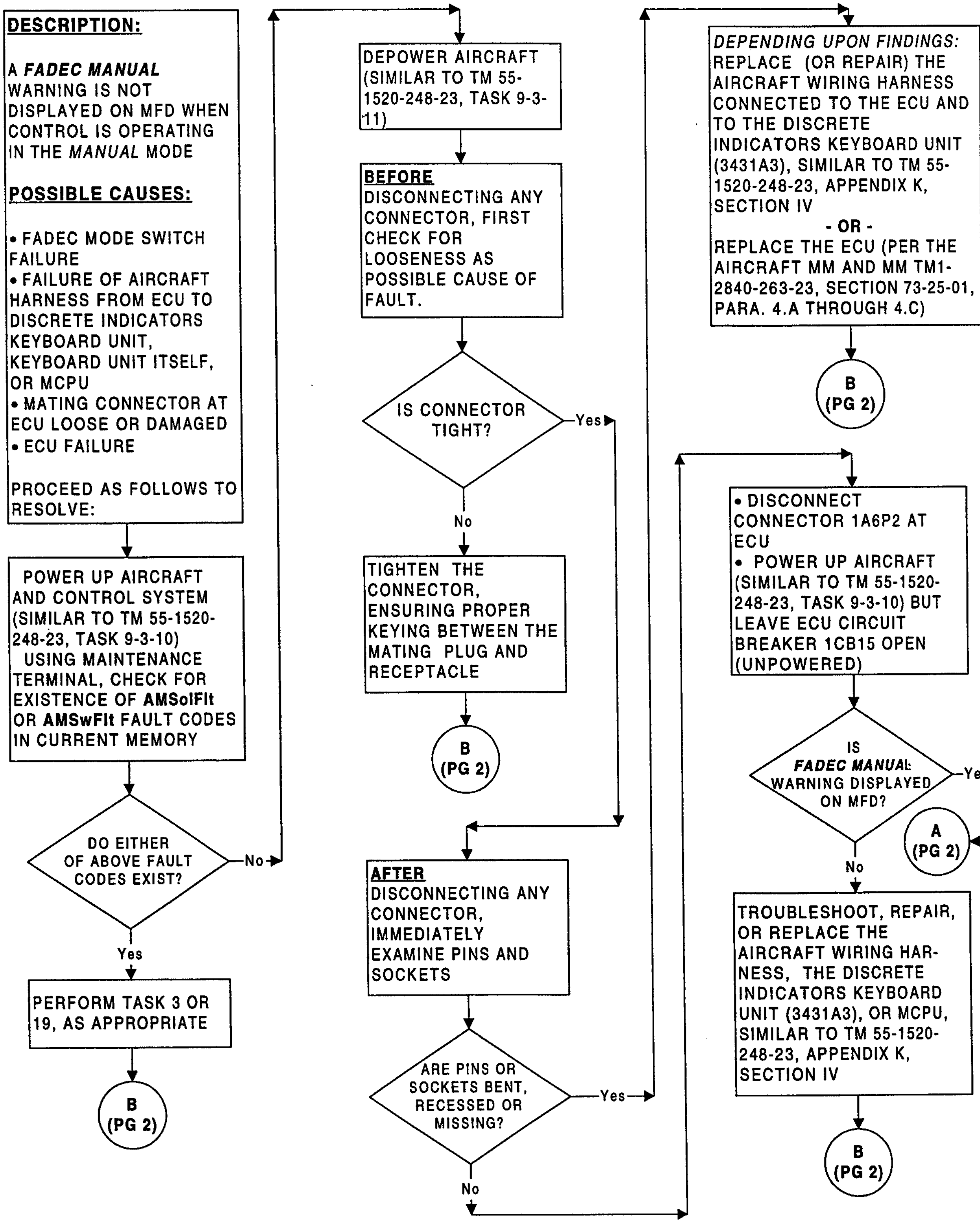
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- USING MAINTENANCE TERMINAL, MONITOR PARAMETERS **ManSel** AND **AutoSel**.
- SELECT MANUAL MODE AND VERIFY THAT **ManSel** = *ON* AND **AutoSel** = *OFF*, AND THAT NO CURRENT **AMSolFlt** OR **AMSwFlt** FAULT CODES EXIST.
- SELECT AUTO MODE AND VERIFY THAT **ManSel** = *OFF* AND **AutoSel** = *ON*, AND THAT NO CURRENT **AMSolFlt** OR **AMSwFlt** FAULT CODES EXIST.
- REPEAT ABOVE VERIFICATIONS WHILE RUNNING ENGINE AT GROUND IDLE, ALSO VERIFYING PROPER TRANSITION TO, AND OPERATION IN, EACH MODE.

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

25 AUG 1998

37. *FADEC MANUAL* WARNING (MFD) INCORRECTLY "OFF"



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37. ***FADEC MANUAL*** WARNING (MFD) INCORRECTLY "OFF"

A

- DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)
- RECONNECT ALL CONNECTORS
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- USING MAINTENANCE TERMINAL, MONITOR **ManSel** AND **AutoSel** PARAMETERS WHILE TOGGLING AUTO/MANUAL SWITCH

PROPER OPERATION IS:
IF AUTO/MANUAL SWITCH IS SET TO AUTO,
AutoSel = ON
-AND-
IF AUTO/MANUAL SWITCH IS SET TO MANUAL,
ManSel = ON

IS AUTO/MANUAL SWITCH OPERATION OK?

Yes

No

TROUBLESHOOT FADEC MODE SWITCH CIRCUIT PER TASK 19 AND/OR SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV

USING MAINTENANCE TERMINAL, MONITOR **ManSel** AND **AutoSel** WHILE TOGGLING WITH AUTO/ MANUAL SWITCH

WHEN **ManSel** = ***ON***, MFD ***FADEC MANUAL*** WARNING SHOULD BE DISPLAYED, AND WHEN **AutoSel** = ***ON***, MFD ***FADEC MANUAL*** WARNING SHOULD NOT BE DISPLAYED

DOES MFD DISPLAY AGREE WITH SWITCH POSITION?

Yes

No

REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C

B

VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- USING MAINTENANCE TERMINAL, MONITOR PARAMETERS **ManSel** AND **AutoSel**.
- SELECT MANUAL MODE AND VERIFY THAT **ManSel** = *ON* AND **AutoSel** = *OFF*, AND THAT NO CURRENT **AMSolFlt** OR **AMSwFlt** FAULT CODES EXIST.
- SELECT AUTO MODE AND VERIFY THAT **ManSel** = *OFF* AND **AutoSel** = *ON*, AND THAT NO CURRENT **AMSolFlt** OR **AMSwFlt** FAULT CODES EXIST.
- REPEAT ABOVE VERIFICATIONS WHILE RUNNING ENGINE AT GROUND IDLE, ALSO VERIFYING PROPER TRANSITION TO, AND OPERATION IN, EACH MODE.

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

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38. N_g (N_1) COCKPIT GAUGE INOPERATIVE OR ERRATIC

ASSOCIATED FAULT INDICATION(S):
Ng12Flt, Ng1CyFlt, Ng1Flt, Ng1RgFlt, Ng1RtFlt, Ng2CyFlt, Ng2Flt, Ng2RgFlt, Ng2RtFlt,

DESCRIPTION:

THE Ng COCKPIT GAUGE IS INOPERATIVE OF EXHIBITS ERRATIC BEHAVIOR

POSSIBLE CAUSES:

- MATING CONNECTORS ON ECU, HARNESSES, OR Ng SENSOR LOOSE OR DAMAGED
- Ng SENSOR FAILURE
- HARNESS FAILURE
- FAILURE IN AIRCRAFT Ng INDICATION SYSTEM
- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10). USING MAINTENANCE TERMINAL, CHECK ***CURRENT FAULTS*** DISPLAY AFTER CYCLING FADEC POWER OFF AND ON (***FADEC*** CIRCUIT BREAKER 1CB15)

ANY OF LISTED ***ASSOCIATED FAULTS*** ACTIVE?

Yes: PERFORM MAINTENANCE TASK 9 AND RELATED VERIFICATION PROCEDURE

No: RESOLVE CONDITION IN ACCORDANCE WITH TM1-2840-263-23, CHAPTER 72-00-00, TABLE 101, AND RELATED SUPPLEMENTARY TROUBLESHOOTING SEQUENCES, AS WELL AS CHAPTER 73-21-00, PARA. 5.

VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
  CYCLE FADEC POWER OFF AND ON (CIRCUIT BREAKER 1CB15)
- USE MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED, TO VERIFY THAT NO FAULTS ARE PRESENT.
- OPERATE ENGINE AT 100% Np WITH FLAT PITCH ROTOR, AND VERIFY NO Ng RELATED FAULTS APPEAR.
- VERIFY PROPER COCKPIT Ng INDICATION.

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

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39. N_p (N_2) COCKPIT GAUGE INOPERATIVE OR ERRATIC

ASSOCIATED FAULT INDICATION(S):
Np12Flt, Np1CyFlt, Np1Flt, Np1RgFlt, Np1RtFlt, Np2CyFlt, Np2Flt, Np2RgFlt, Np2RtFlt,

DESCRIPTION:

THE Np COCKPIT GAUGE IS INOPERATIVE OF EXHIBITS ERRATIC BEHAVIOR

POSSIBLE CAUSES:

- MATING CONNECTORS ON ECU, HARNESSES, OR Np SENSOR LOOSE OR DAMAGED
- Np SENSOR FAILURE
- HARNESS FAILURE
- FAILURE IN AIRCRAFT Np INDICATION SYSTEM
- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10). USING MAINTENANCE TERMINAL, CHECK ***CURRENT FAULTS*** DISPLAY AFTER CYCLING FADEC POWER OFF AND ON (***FADEC*** CIRCUIT BREAKER 1CB15)

ANY OF LISTED ***ASSOCIATED FAULTS*** ACTIVE?

No → RESOLVE CONDITION IN ACCORDANCE WITH TM1-2840-263-23, CHAPTER 72-00-00, TABLE 101, AND RELATED SUPPLEMENTARY TROUBLESHOOTING SEQUENCES, AS WELL AS CHAPTER 73-21-00, PARA. 4.

Yes → PERFORM MAINTENANCE TASK 8 AND RELATED VERIFICATION PROCEDURE

VERIFICATION PROCEDURE:

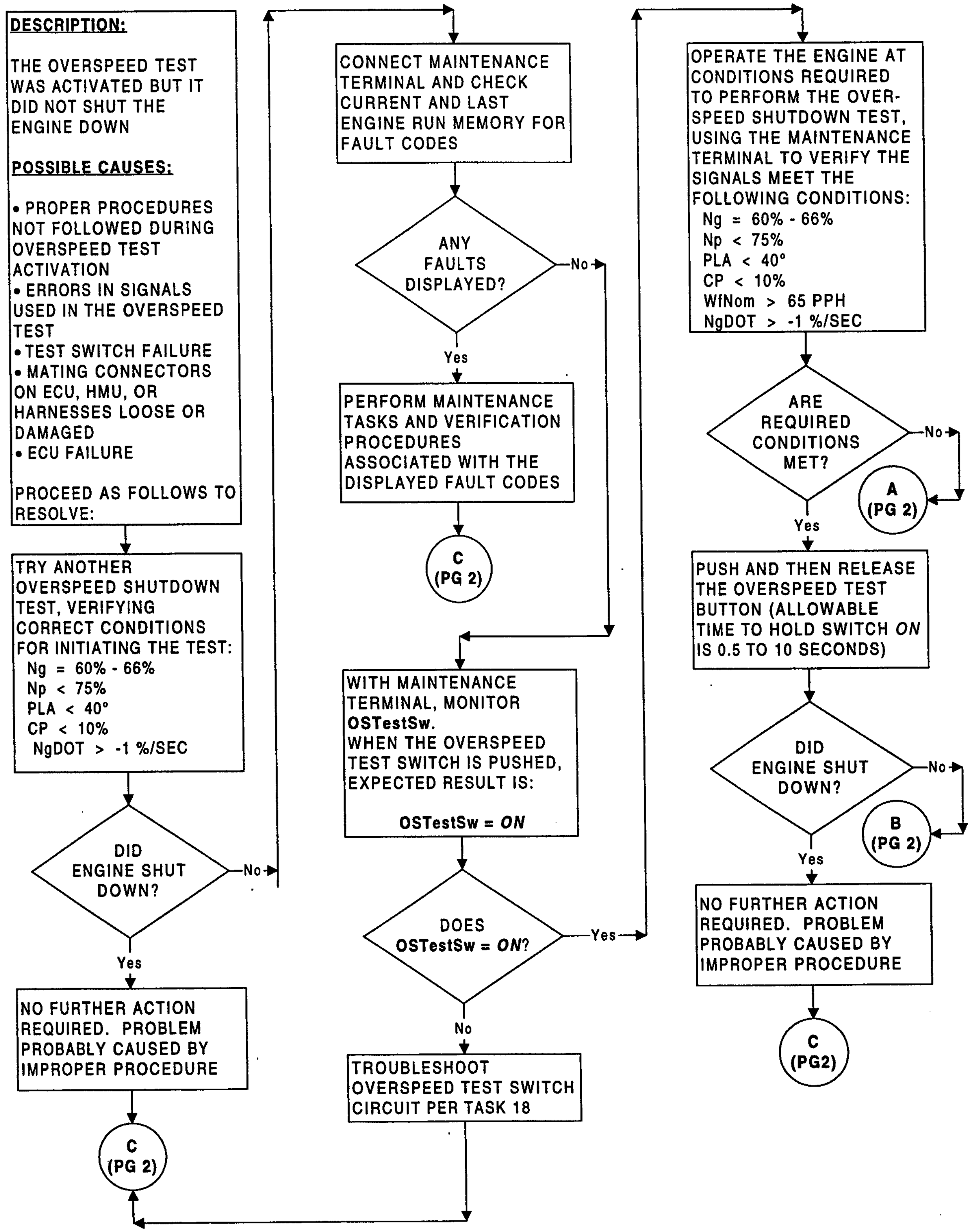
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
  CYCLE FADEC POWER OFF AND ON (CIRCUIT BREAKER 1CB15)
- USE MAINTENANCE TERMINAL, WITH ***CURRENT FAULTS*** DISPLAY SELECTED, TO VERIFY THAT NO FAULTS ARE PRESENT.
- OPERATE ENGINE AT 100% Np WITH FLAT PITCH ROTOR, AND VERIFY NO Np RELATED FAULTS APPEAR.
- VERIFY PROPER COCKPIT DUAL TACHOMETER Np INDICATION.

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

25 AUG 1998

40. OVERSPEED TEST FAILS TO OPERATE



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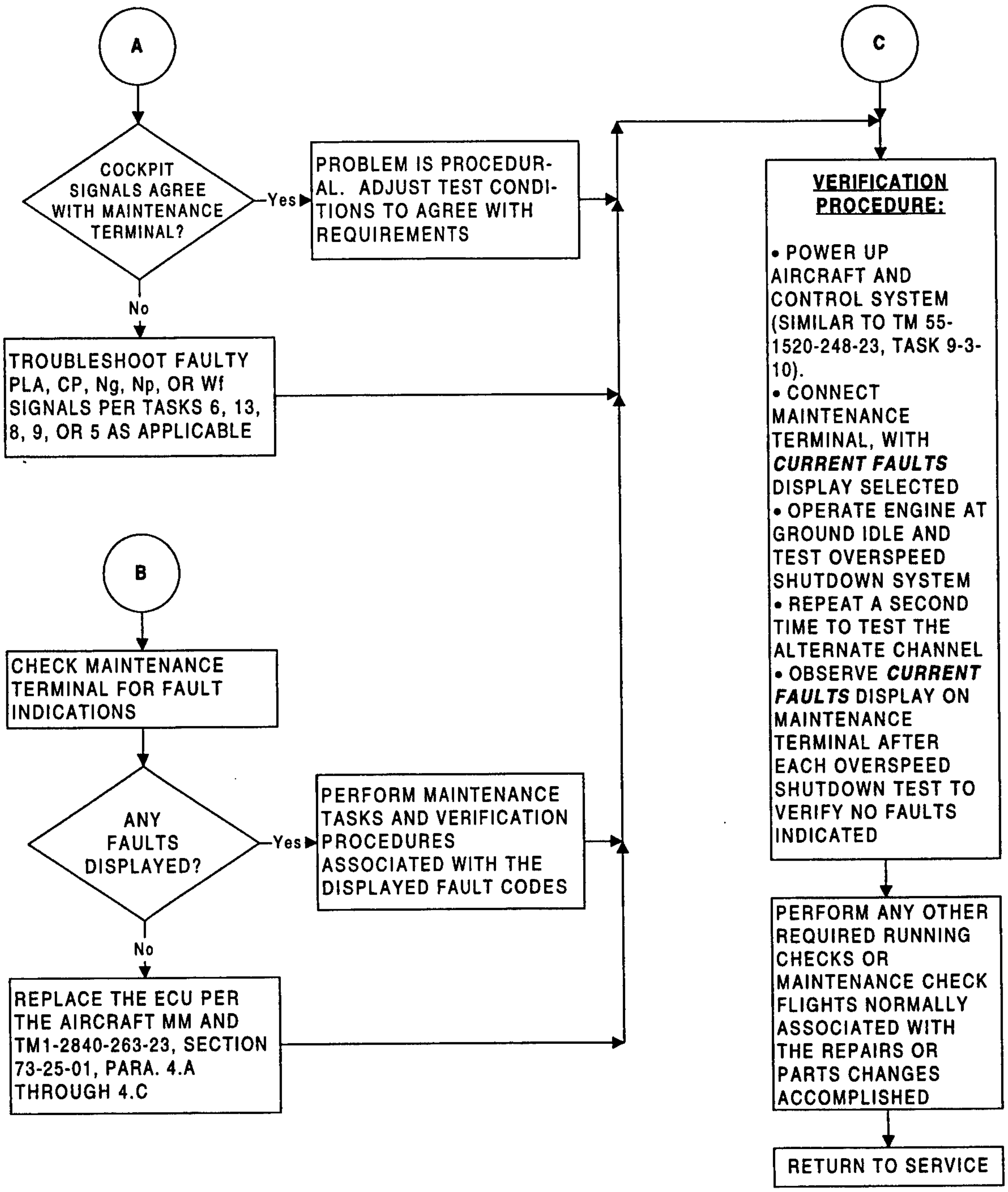
40. OVERSPEED TEST FAILS TO OPERATE



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41. *ENGINE OUT* WARNING (MFD) INCORRECTLY "ON"

DESCRIPTION:

AN ***ENGINE OUT*** WARNING IS DISPLAYED ON MFD WHEN ENGINE IS RUNNING ABOVE 55% Ng

POSSIBLE CAUSES:

- FAILURE OF AIRCRAFT HARNESS FROM ECU TO DISCRETE INDICATORS KEYBOARD UNIT, KEYBOARD UNIT ITSELF, OR MCPU
- MATING CONNECTOR AT ECU LOOSE OR DAMAGED
- ECU FAILURE
- SIGNAL ERRORS

PROCEED AS FOLLOWS TO RESOLVE:

DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT?

No: TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE → B (PG 2)

Yes:

AFTER DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING?

Yes: ~~*DEPENDING UPON FINDINGS:*~~
REPLACE (OR REPAIR) THE AIRCRAFT WIRING HARNESS CONNECTED TO THE ECU AND TO THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV

- OR -

REPLACE THE ECU (PER THE AIRCRAFT MM AND MM TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C) → B (PG 2)

No:

- DISCONNECT CONNECTOR 1A6P2 AT ECU
- POWER UP AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10), BUT LEAVE ECU POWER OFF (CIRCUIT BREAKER 1CB15 PULLED)
- CONNECT A FREQUENCY GENERATOR TO SOCKETS 76 AND 77 OF CONNECTOR 1A6P2, TO SIMULATE AN Ng SIGNAL
- SET THE FREQUENCY TO 10000 - 11000 HZ
- CHECK MFD FOR ***ENGINE OUT*** WARNING

IS ***ENGINE OUT*** WARNING DISPLAYED?

Yes: TROUBLESHOOT THE AIRCRAFT WIRING HARNESS, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), OR THE MCPU (SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV) → B (PG 2)

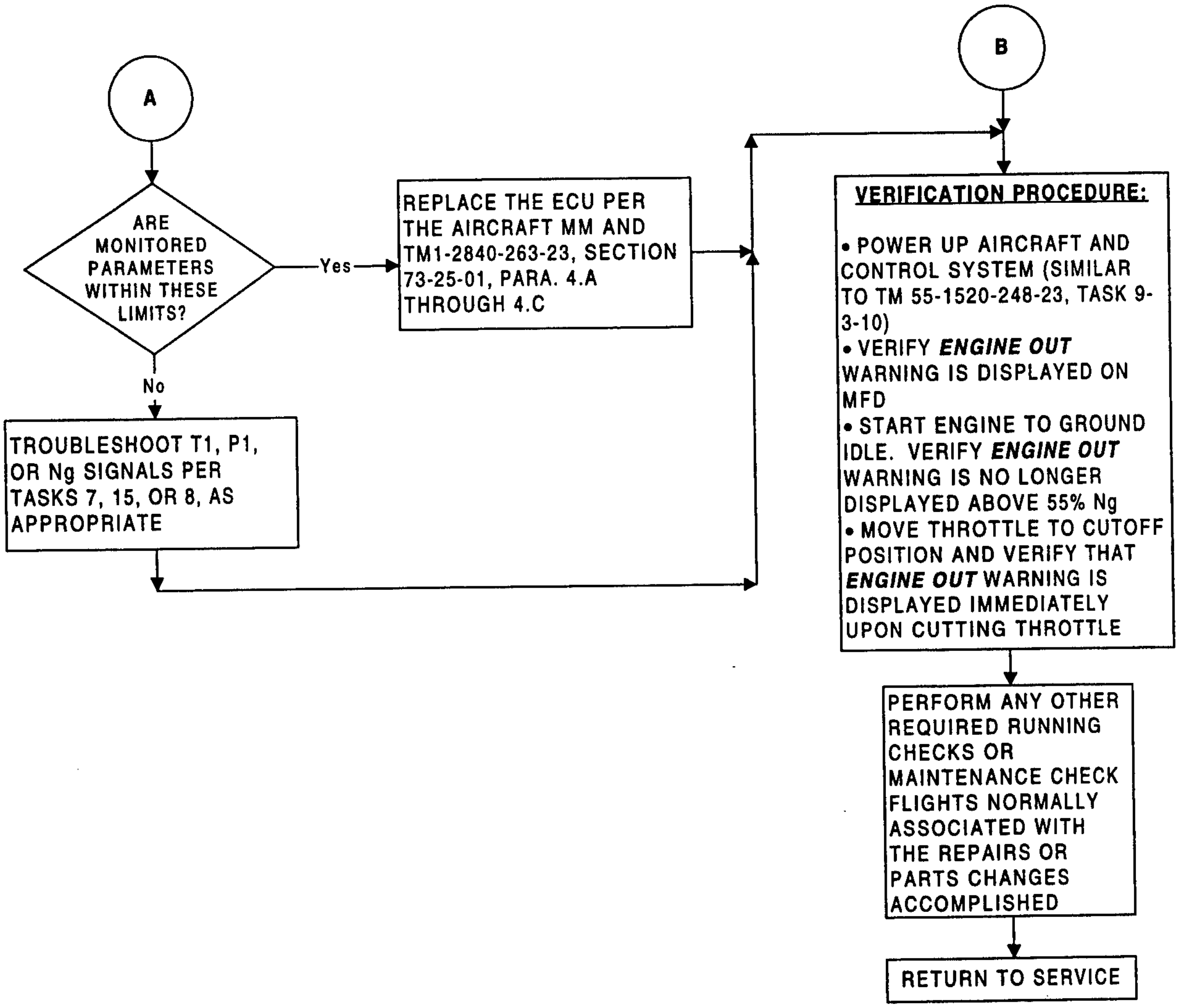
No:

- DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)
- RECONNECT ALL CONNECTORS
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- CONNECT MAINTENANCE TERMINAL AND SET UP TO MONITOR T1, P1, Ng, AND NgDOT
- OPERATE ENGINE AT 100% Np, WITH ROTOR AT FLAT PITCH
- VERIFY THAT T1 IS WITHIN ±10°F OF AMBIENT TEMPERATURE, P1 IS WITHIN ±1 PSI OF AMBIENT PRESSURE, Ng IS NOT ERRATIC, AND NgDOT IS WITHIN ±5 %/SEC

→ A (PG 2)

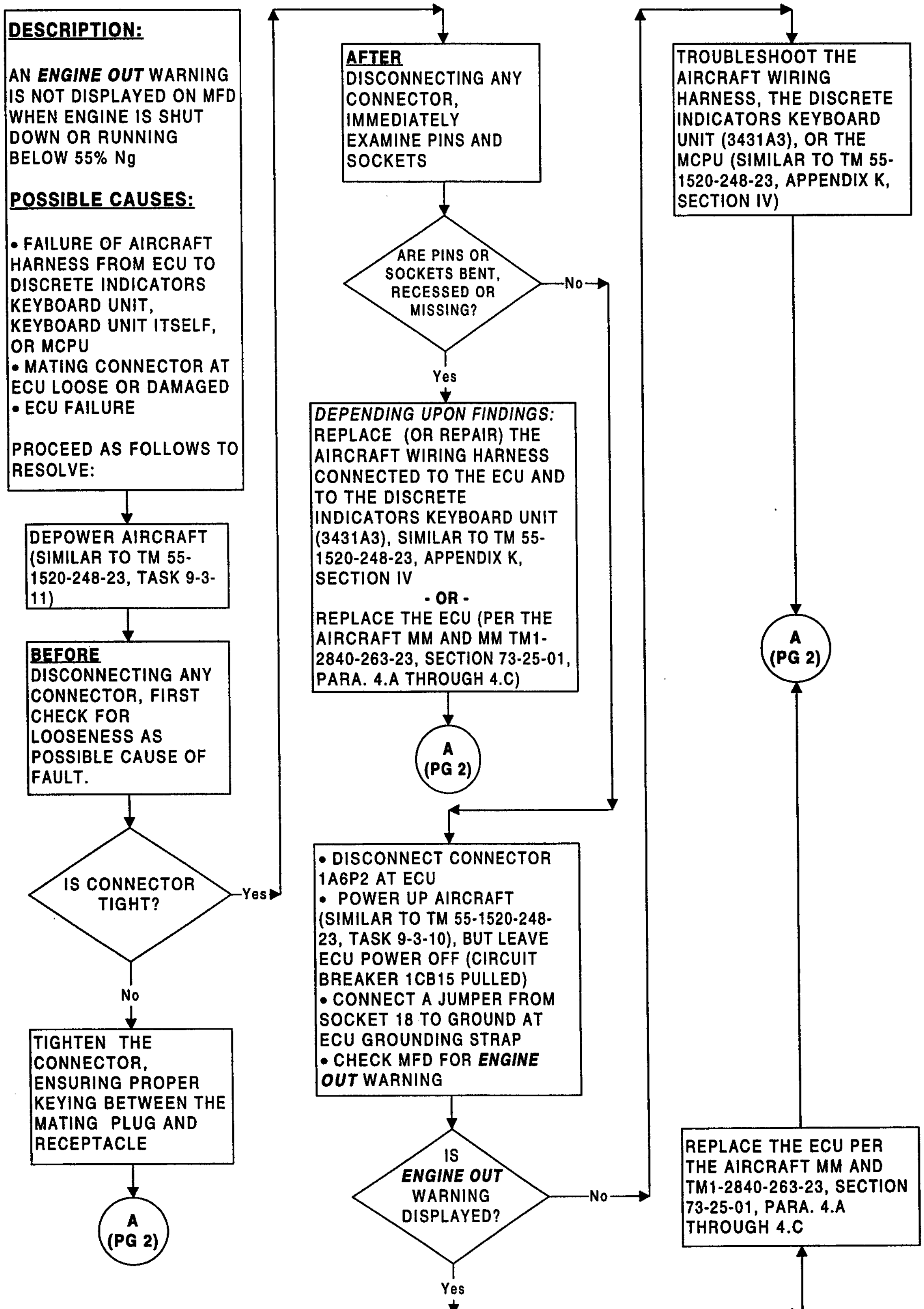
26 AUG 1998

41. *ENGINE OUT* WARNING (MFD) INCORRECTLY "ON"



26 AUG 1998

42. *ENGINE OUT* WARNING (MFD) INCORRECTLY "OFF"



26 AUG 1998

A

VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- VERIFY ***ENGINE OUT*** WARNING IS DISPLAYED ON MFD
- START ENGINE TO GROUND IDLE. VERIFY ***ENGINE OUT*** WARNING IS NO LONGER DISPLAYED ABOVE 55% Ng
- MOVE THROTTLE TO CUTOFF POSITION AND VERIFY THAT ***ENGINE OUT*** WARNING IS DISPLAYED IMMEDIATELY UPON CUTTING THROTTLE

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

26 AUG 1998

43. *FADEC MAINT.* ADVISORY (MFD) INCORRECTLY "ON"

DESCRIPTION:

A ***FADEC MAINT*** ADVISORY IS DISPLAYED ON MFD BUT NO ***CURRENT*** OR ***LAST ENGINE RUN*** FAULTS ARE INDICATED

POSSIBLE CAUSES:

- FAILURE OF AIRCRAFT HARNESS FROM ECU TO DISCRETE INDICATORS KEYBOARD UNIT, KEYBOARD UNIT ITSELF, OR MCPU
- MATING CONNECTOR AT ECU LOOSE OR DAMAGED
- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10). PLACE THROTTLE IN CUTOFF POSITION. USING MAINTENANCE TERMINAL, CHECK ***CURRENT FAULTS*** AND ***LAST ENGINE RUN FAULTS*** DISPLAYS AFTER CYCLING FADEC POWER OFF AND ON (***FADEC*** CIRCUIT BREAKER 1CB15)

ARE ANY FAULT CODES INDICATED?

Yes

MFD ***FADEC MAINT*** ADVISORY IS CORRECT.

PERFORM MAINTENANCE TASKS AND VERIFICATION PROCEDURES ASSOCIATED WITH THE INDICATED FAULT CODES

B (PG 2)

No

DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT?

No

TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE

B (PG 2)

Yes

AFTER DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING?

Yes

DEPENDING UPON FINDINGS: REPLACE (OR REPAIR) THE AIRCRAFT WIRING HARNESS CONNECTED TO THE ECU AND TO THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV

- OR -

REPLACE THE ECU (PER THE AIRCRAFT MM AND MM TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)

B (PG 2)

No

- DISCONNECT CONNECTOR 1A6P2 AT ECU
- POWER UP AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10), BUT LEAVE ECU POWER OFF (CIRCUIT BREAKER 1CB15 PULLED)
- CHECK MFD FOR ***FADEC MAINT*** ADVISORY DISPLAY

IS ***FADEC MAINT*** ADVISORY DISPLAYED?

Yes

A (PG 2)

No

REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C

B (PG 2)

01 SEP 1998

A

TROUBLESHOOT THE AIRCRAFT WIRING HARNESS, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), OR THE MCPU (SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV)

B

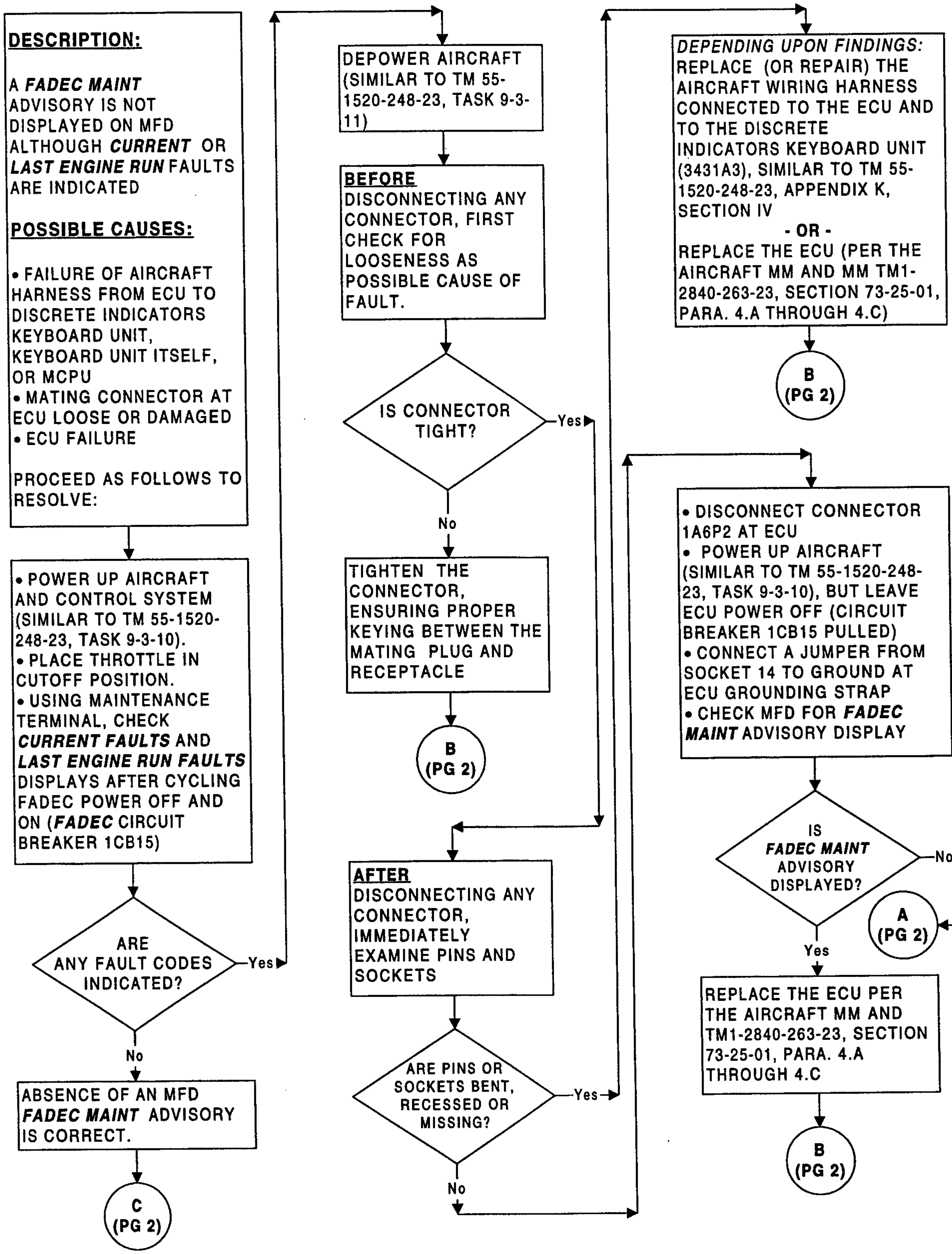
VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- CYCLE FADEC POWER OFF AND ON (BREAKER 1CB15)
- SET THROTTLE TO GROUND IDLE
- CONNECT MAINTENANCE TERMINAL AND VERIFY NO ***CURRENT*** FAULTS SHOWING
- VERIFY ***FADEC MAINT*** ADVISORY IS NOT DISPLAYED ON MFD
- DISCONNECT COLLECTIVE PITCH POTENTIOMETER CONNECTOR (1MT10J1) TO CREATE A FAULT
- VERIFY THAT ***FADEC MAINT*** ADVISORY IS DISPLAYED ON MFD
- RECONNECT COLLECTIVE PITCH POTENTIOMETER CONNECTOR
- CYCLE FADEC POWER OFF AND ON (BREAKER 1CB15), AND VERIFY ***FADEC MAINT*** ADVISORY IS NOT DISPLAYED

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

44. *FADEC MAINT.* ADVISORY (MFD) INCORRECTLY "OFF"



01 SEP 1998

A

TROUBLESHOOT THE AIRCRAFT WIRING HARNESS, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), OR THE MCPU (SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV)

B

- DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)
- RECONNECT ALL CONNECTORS
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- CONNECT MAINTENANCE TERMINAL AND SET UP TO VIEW ***CURRENT*** AND ***LAST ENGINE RUN*** FAULTS
- PERFORM MAINTENANCE TASKS AND VERIFICATION PROCEDURES ASSOCIATED WITH THE INDICATED FAULT CODES

C

VERIFICATION PROCEDURE:

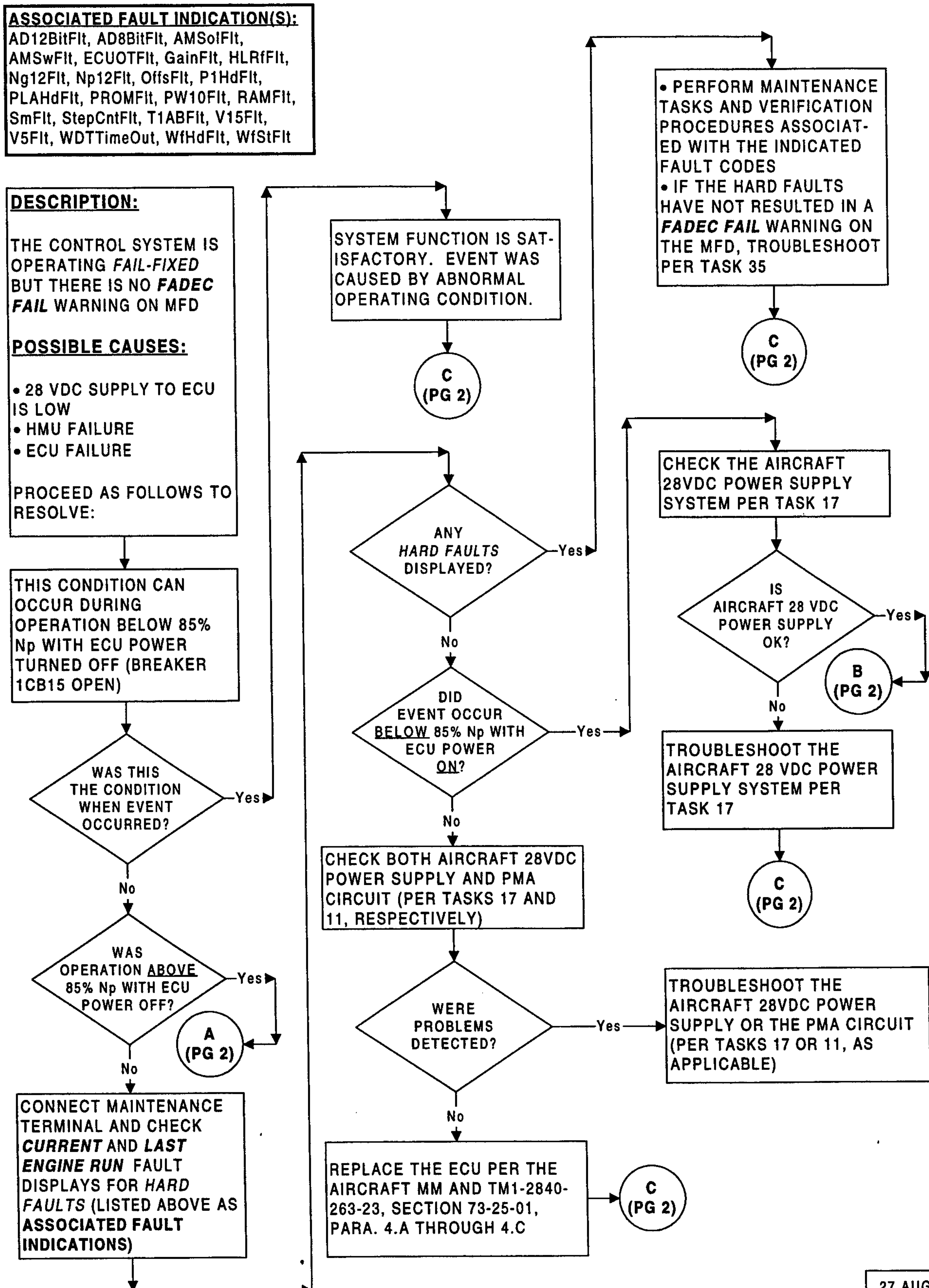
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- CYCLE FADEC POWER OFF AND ON (BREAKER 1CB15)
- SET THROTTLE TO GROUND IDLE
- CONNECT MAINTENANCE TERMINAL AND VERIFY NO ***CURRENT*** FAULTS SHOWING
- VERIFY ***FADEC MAINT*** ADVISORY IS NOT DISPLAYED ON MFD
- DISCONNECT COLLECTIVE PITCH POTENTIOMETER CONNECTOR (1MT10J1) TO CREATE A FAULT
- VERIFY THAT ***FADEC MAINT*** ADVISORY IS DISPLAYED ON MFD
- RECONNECT COLLECTIVE PITCH POTENTIOMETER CONNECTOR
- CYCLE FADEC POWER OFF AND ON (BREAKER 1CB15), AND VERIFY ***FADEC MAINT*** ADVISORY IS NOT DISPLAYED

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

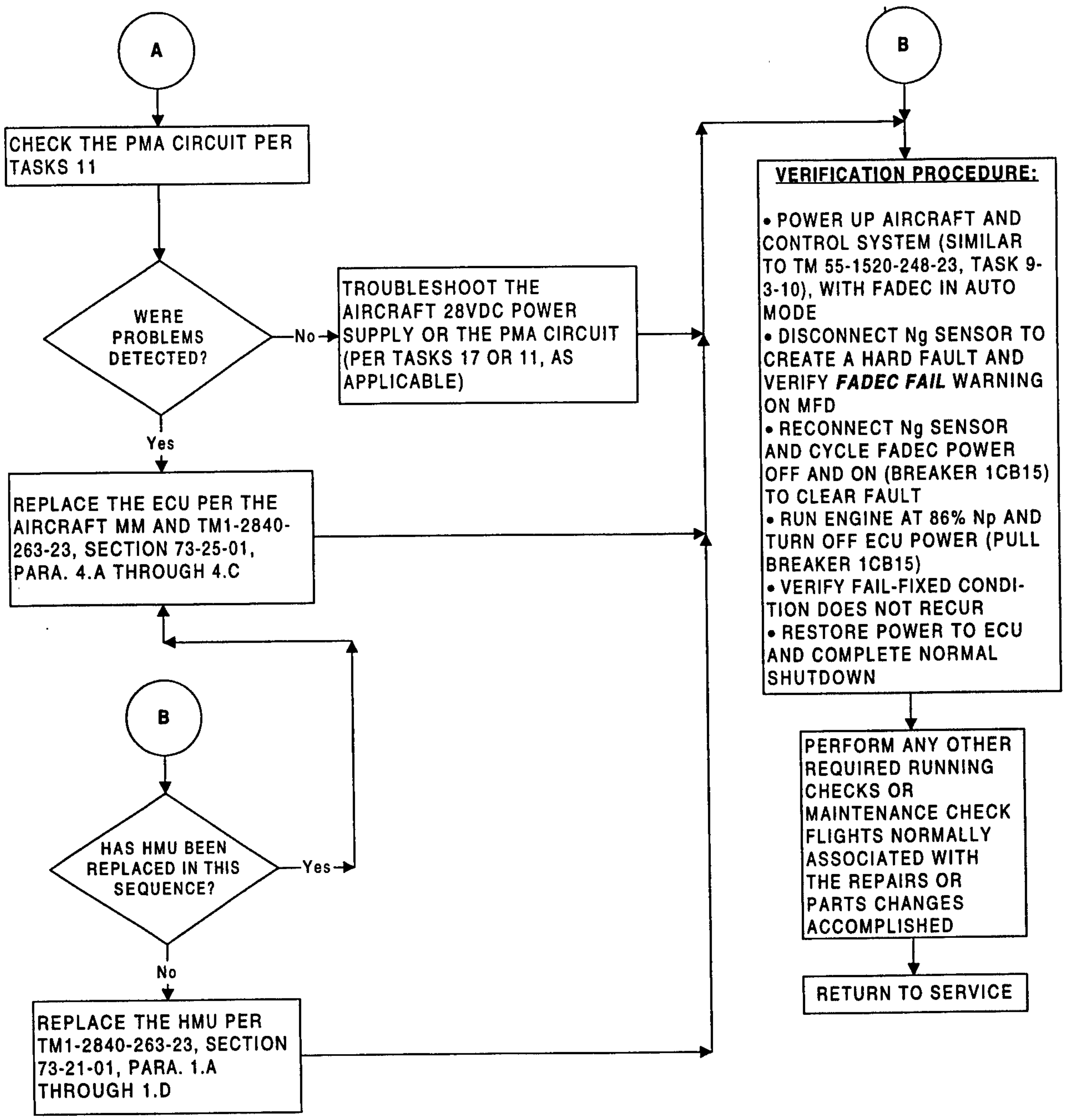
01 SEP 1998

45. FADEC FAILS FIXED WITH NO MFD *FADEC FAIL* WARNING



27 AUG 1998

45. FADEC FAILS FIXED WITH NO MFD *FADEC FAIL* WARNING



27 AUG 1998

46. MANUAL MODE OPERATIONAL PROBLEM

DESCRIPTION:

THE ENGINE IS OPERATING IN MANUAL MODE, BUT MANUAL MODE IS NOT OPERATING PROPERLY

POSSIBLE CAUSES:

- HMU FAILURE
- FUEL SYSTEM COMPONENT FAILURE
- THROTTLE RIGGING PROBLEM
- AIRCRAFT POWER SUPPLY FAILURE
- ECU POWER SUPPLY FAILURE
- FUEL SYSTEM CONTAMINATION

PROCEED AS FOLLOWS TO RESOLVE:

CONNECT MAINTENANCE TERMINAL AND CHECK ***CURRENT*** AND ***LAST ENGINE RUN*** FAULT DISPLAYS

ARE ANY FAULT CODES DISPLAYED?

Yes

PERFORM MAINTENANCE TASKS AND VERIFICATION PROCEDURES ASSOCIATED WITH THE INDICATED FAULT CODES

C (PG 2)

No

CHECK RIGGING OF HMU THROTTLE LEVER TO TWIST GRIP PER TM 1-2840-263-23, CHAPTER 73-21-01, PARA. 1.D.

WAS RIGGING OK?

No

ADJUST RIGGING OF HMU THROTTLE LEVER TO TWIST GRIP PER TM 1-2840-263-23, CHAPTER 73-21-01, PARA. 1.D.

C (PG 2)

Yes

- DEPOWER AIRCRAFT (SIMILAR TO TM 55- 1520-248-23, TASK 9-3-11)
- DISCONNECT CONNECTOR 1A6P2 AT ECU
- POWER UP AIRCRAFT AND CONTROL SYSTEM ON SHIP'S BATTERY
- CHECK FOR PRESENCE OF 28 VDC POWER AT SOCKET 25. MEASURE BETWEEN SOCKET AND GROUND STRAP.

LIMIT 28 ± 1 VDC

IS VOLTAGE WITHIN LIMITS?

No

TROUBLESHOOT THE AIRCRAFT 28 VDC POWER SUPPLY SYSTEM PER TASK 17

C (PG 2)

Yes

- DEPOWER ECU (PULL BREAKER 1CB15)
- RECONNECT CONNECTOR 1A6P2 AT ECU
- DISCONNECT CONNECTOR P4 AT HMU
- POWER UP ECU (BREAKER 1CB15) ON SHIP'S BATTERY
- SELECT MANUAL MODE
- CHECK FOR PRESENCE OF 28 VDC POWER BETWEEN SOCKETS **R** & **S**. (THIS POWERS THE HOT START ABORT SOLENOID)

LIMIT 28 ± 1 VDC

IS VOLTAGE WITHIN LIMITS?

Yes

A (PG 2)

No

HAS ECU BEEN REPLACED IN THIS SEQUENCE?

Yes

B (PG 2)

No

REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C

C (PG 2)

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46. MANUAL MODE OPERATIONAL PROBLEM

A

• INSPECT AIRCRAFT FUEL SYSTEM FOR EVIDENCE OF EXCESSIVE WATER IN FUEL, USING NORMAL TANK SAMPLING PROCEDURE.
• INSPECT ENGINE FUEL FILTER IMPENDING BYPASS POP-OUT INDICATOR AND, IF EXTENDED, INSPECT FILTER ELEMENT FOR CONTAMINATION IAW TM1-2840-263-23, SECTION 73-10-01, PARA. 2.A.

EVIDENCE OF FUEL CONTAMINATION?

No → REPLACE THE HMU PER TM1-2840-263-23, SECTION 73-21-01, PARA. 1.A THROUGH 1.D → VERIFICATION PROCEDURE

Yes →
• DEFUEL, FLUSH, AND REFUEL AIRCRAFT FUEL SYSTEM SIMILAR TO AIRCRAFT MAINTENANCE MANUAL TM 55-1520-248-23, TASKS 1-4-3 AND 1-4-2
• CLEAN ENGINE FUEL FILTER ASSEMBLY AND REPLACE ELEMENT PER TM1-2840-263-23, SECTION 73-10-01, PARA. 2.B AND 2.C.
• PURGE HMU PER TM1-2840-263-23, SECTION 73-00-00, PARA. 1.B.
→ VERIFICATION PROCEDURE

B

TROUBLESHOOT HOT START ABORT SOLENOID CIRCUIT PER TASK 2 → VERIFICATION PROCEDURE

C

VERIFICATION PROCEDURE:

• POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10), WITH FADEC IN AUTO MODE
• CONNECT MAINTENANCE TERMINAL AND VERIFY NO ***CURRENT FAULTS*** DISPLAYED
• OPERATE ENGINE AT GROUND IDLE AND SELECT MANUAL MODE
• INCREASE SPEED TO 100% Np WITH FLAT ROTOR PITCH AND VERIFY FREEDOM FROM FAULTS AND SATISFACTORY OPERATION IN BOTH MANUAL AND AUTO MODES
• PERFORM POWER AVAILABILITY CHECKS IN BOTH CONTROL MODES

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

27 AUG 1998

47. MAINTENANCE TERMINAL COMMUNICATION FAULT

DESCRIPTION:

THE MAINTENANCE TERMINAL (MT) DOES NOT COMMUNICATE WITH THE ECU ("NO ECU AVAILABLE" OR OTHER COMMUNICATION FAILURE MESSAGE DISPLAYED ON SCREEN OF MAINTENANCE TERMINAL)

POSSIBLE CAUSES:

- ECU NOT POWERED
- MAINTENANCE TERMINAL CABLE FAILURE
- PROBLEM WITH MAINTENANCE TERMINAL SET-UP, SOFTWARE FILES, OR COMPATIBILITY
- ECU CONFIGURATION INCORRECT
- MATING CONNECTORS ON ECU, MAINTENANCE TERMINAL, OR HARNESSES LOOSE OR DAMAGED
- AIRCRAFT HARNESS FAILURE
- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

CHECK THAT ECU IS POWERED UP (AIRCRAFT POWERED AND BREAKER 1CB15 CLOSED), AND THAT MAINTENANCE TERMINAL IS PROPERLY CONNECTED TO AIRCRAFT CONNECTOR 1J12.
TRY AGAIN TO ESTABLISH COMMUNICATION

ABLE TO COMMUNICATE WITH ECU?

Yes → B (PG 2)

No → ARE MT HARDWARE & SOFTWARE COMPATIBLE W/ ECU VERSION?

No → LOAD CORRECT FILES FROM KNOWN SOURCE INTO MT, OR USE A DIFFERENT MT KNOWN TO BE SATISFACTORY

Yes → USE A DIFFERENT MT KNOWN TO BE SATISFACTORY

ABLE TO COMMUNICATE WITH ECU?

Yes → B (PG 2)

No → DEPOWER AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55- 1520-248-23, TASK 9-3-11), AND TURN OFF MAINTENANCE TERMINAL

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT?

No → TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE → B (PG 2)

Yes → **AFTER** DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING?

No → A (PG 2)

Yes → *DEPENDING UPON FINDINGS:*
REPLACE (OR REPAIR) THE AIRCRAFT WIRING HARNESS CONNECTED TO THE ECU AND TO THE MAINTENANCE TERMINAL, SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV

- OR -

REPLACE THE MAINTENANCE TERMINAL CABLE

- OR -

REPLACE THE ECU (PER THE AIRCRAFT MM AND MM TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)

→ B (PG 2)

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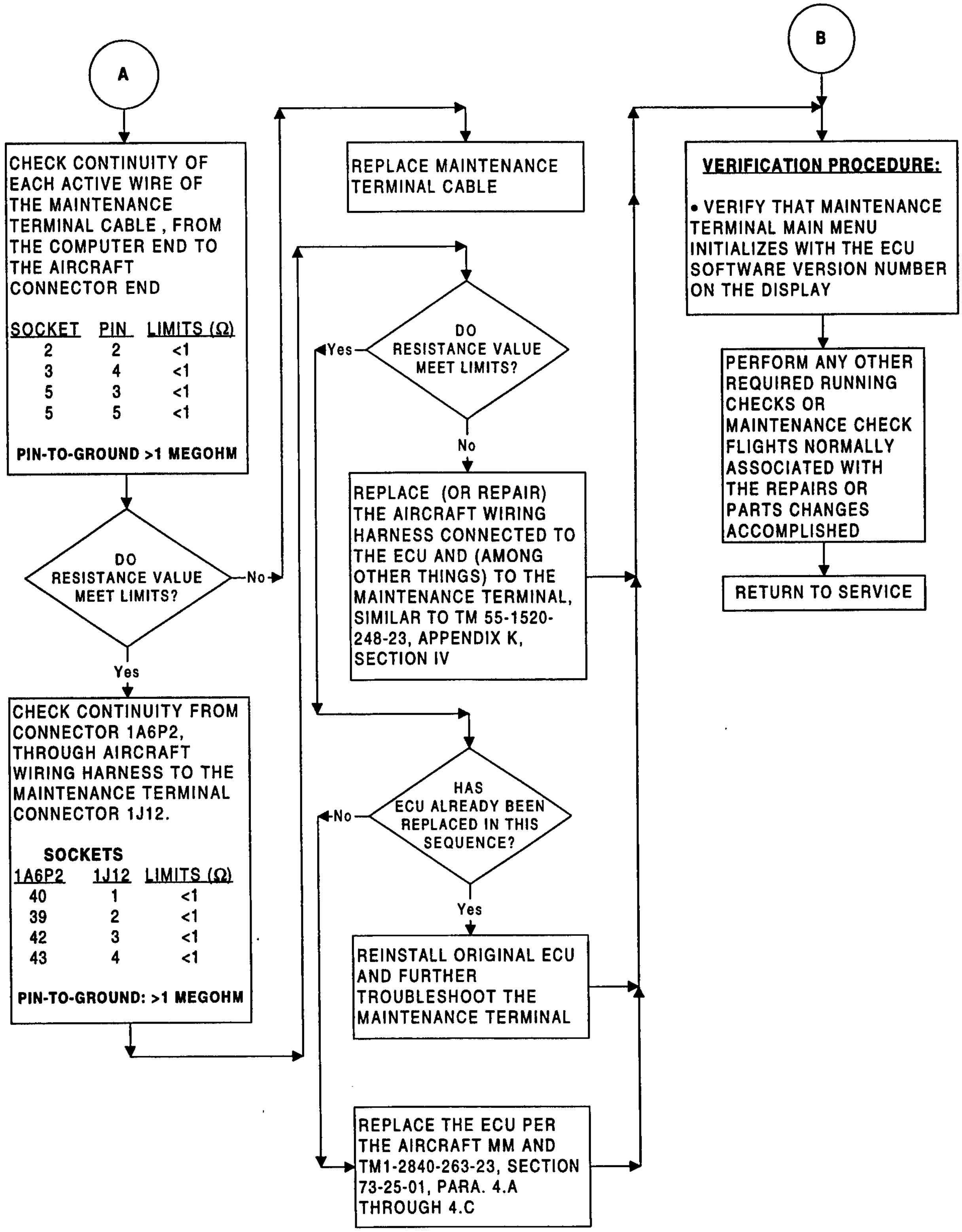
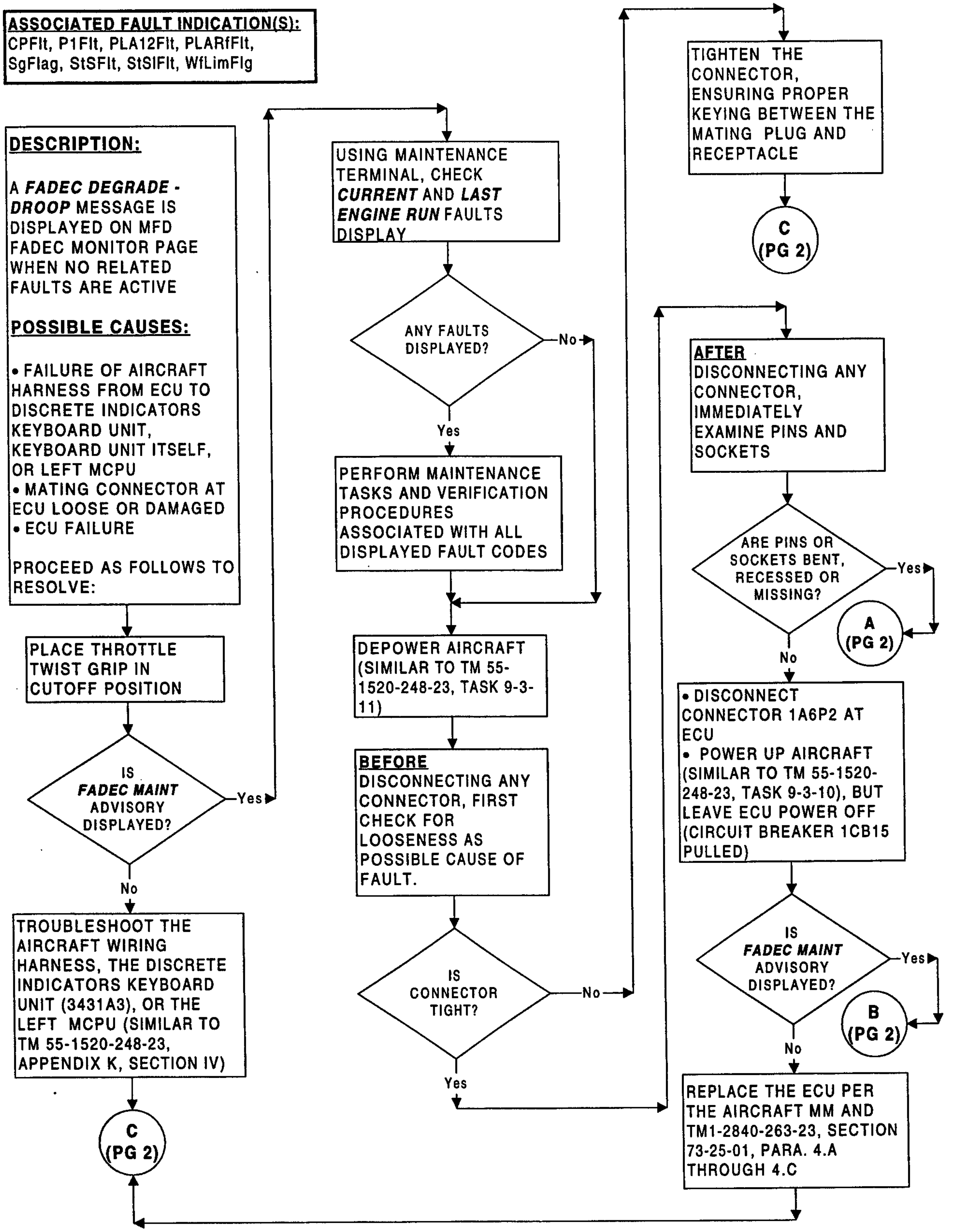


A
CHECK CONTINUITY OF EACH ACTIVE WIRE OF THE MAINTENANCE TERMINAL CABLE , FROM THE COMPUTER END TO THE AIRCRAFT CONNECTOR END
SOCKET PIN LIMITS (Ω)
2 2 <1
3 4 <1
5 3 <1
5 5 <1
PIN-TO-GROUND >1 MEGOHM
DO RESISTANCE VALUE MEET LIMITS?
No
Yes
CHECK CONTINUITY FROM CONNECTOR 1A6P2, THROUGH AIRCRAFT WIRING HARNESS TO THE MAINTENANCE TERMINAL CONNECTOR 1J12.
SOCKETS
1A6P2 1J12 LIMITS (Ω)
40 1 <1
39 2 <1
42 3 <1
43 4 <1
PIN-TO-GROUND: >1 MEGOHM
REPLACE MAINTENANCE TERMINAL CABLE
DO RESISTANCE VALUE MEET LIMITS?
Yes
No
REPLACE (OR REPAIR) THE AIRCRAFT WIRING HARNESS CONNECTED TO THE ECU AND (AMONG OTHER THINGS) TO THE MAINTENANCE TERMINAL, SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV
HAS ECU ALREADY BEEN REPLACED IN THIS SEQUENCE?
No
Yes
REINSTALL ORIGINAL ECU AND FURTHER TROUBLESHOOT THE MAINTENANCE TERMINAL
REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C
B
VERIFICATION PROCEDURE:
• VERIFY THAT MAINTENANCE TERMINAL MAIN MENU INITIALIZES WITH THE ECU SOFTWARE VERSION NUMBER ON THE DISPLAY
PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED
RETURN TO SERVICE

27 AUG 1998

48. ***FADEC DEGRADE - DROOP*** MESSAGE (MFD) INCORRECTLY "ON"



01 SEP 1998

48. *FADEC DEGRADE - DROOP* MESSAGE (MFD) INCORRECTLY "ON"

A

DEPENDING UPON FINDINGS:
REPLACE (OR REPAIR) THE AIRCRAFT WIRING HARNESS CONNECTED TO THE ECU, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), AND THE LEFT MCPU (3431A1) SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV

- OR -

REPLACE THE ECU (PER THE AIRCRAFT MM AND MM TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)

B

TROUBLESHOOT THE AIRCRAFT WIRING HARNESS, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), OR THE LEFT MCPU (SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV)

C

VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- PLACE THROTTLE TWIST GRIP IN GROUND IDLE POSITION
- VERIFY ***FADEC DEGRADE - DROOP*** NOT DISPLAYED ON MFD FADEC MONITOR PAGE AND ***FADEC MAINT*** NOT DISPLAYED ON MFD INITIAL PAGE 1
- USING MAINTENANCE TERMINAL VERIFY ***NO CURRENT FAULTS***
- DISCONNECT COLLECTIVE PITCH POTENTIOMETER CONNECTOR 1MT10J1 TO CREATE A DROOP-RELATED FAULT
- VERIFY ***FADEC DEGRADE - DROOP*** IS NOW DISPLAYED ON MFD FADEC MONITOR PAGE AND ***FADEC MAINT*** DISPLAYED ON MFD INITIAL PAGE 1
- RECONNECT COLLECTIVE PITCH POTENTIOMETER CONNECTOR AND CYCLE ECU POWER OFF AND ON (BREAKER 1CB15) TO CLEAR FAULT
- VERIFY ***FADEC DEGRADE - DROOP*** AND ***FADEC MAINT*** MESSAGES NO LONGER DISPLAYED

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

01 SEP 1998

49. *FADEC DEGRADE - DROOP* MESSAGE (MFD) INCORRECTLY "OFF"

ASSOCIATED FAULT INDICATION(S):
CPFlt, P1Flt, PLA12Flt, PLARfFlt, SgFlag, StSFlt, StSIFlt, WfLimFlg

DESCRIPTION:

A ***FADEC DEGRADE - DROOP*** MESSAGE IS NOT DISPLAYED ON MFD FADEC MONITOR PAGE WHEN ASSOCIATED FAULTS ARE ACTIVE

POSSIBLE CAUSES:

- FAILURE OF AIRCRAFT HARNESS FROM ECU TO DISCRETE INDICATORS KEYBOARD UNIT, KEYBOARD UNIT ITSELF, OR LEFT MCPU
- MATING CONNECTOR AT ECU LOOSE OR DAMAGED
- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- PLACE THROTTLE TWIST GRIP IN CUTOFF POSITION
- CHECK WHETHER ***FADEC MAINT*** ADVISORY IS DISPLAYED ON MFD
- USING MAINTENANCE TERMINAL, CHECK ***CURRENT*** AND ***LAST ENGINE RUN FAULTS*** DISPLAYS

DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT?

No → TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE → C (PG 2)

Yes → **AFTER** DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING?

Yes → B (PG 2)

No →

- DISCONNECT CONNECTOR 1A6P2 AT ECU
- POWER UP AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10), BUT LEAVE ECU POWER OFF (CIRCUIT BREAKER 1CB15 PULLED)
- CONNECT A JUMPER FROM SOCKET 14 TO GROUND AT ECU GROUNDING STRAP
- CHECK MFD FOR ***FADEC MAINT*** ADVISORY

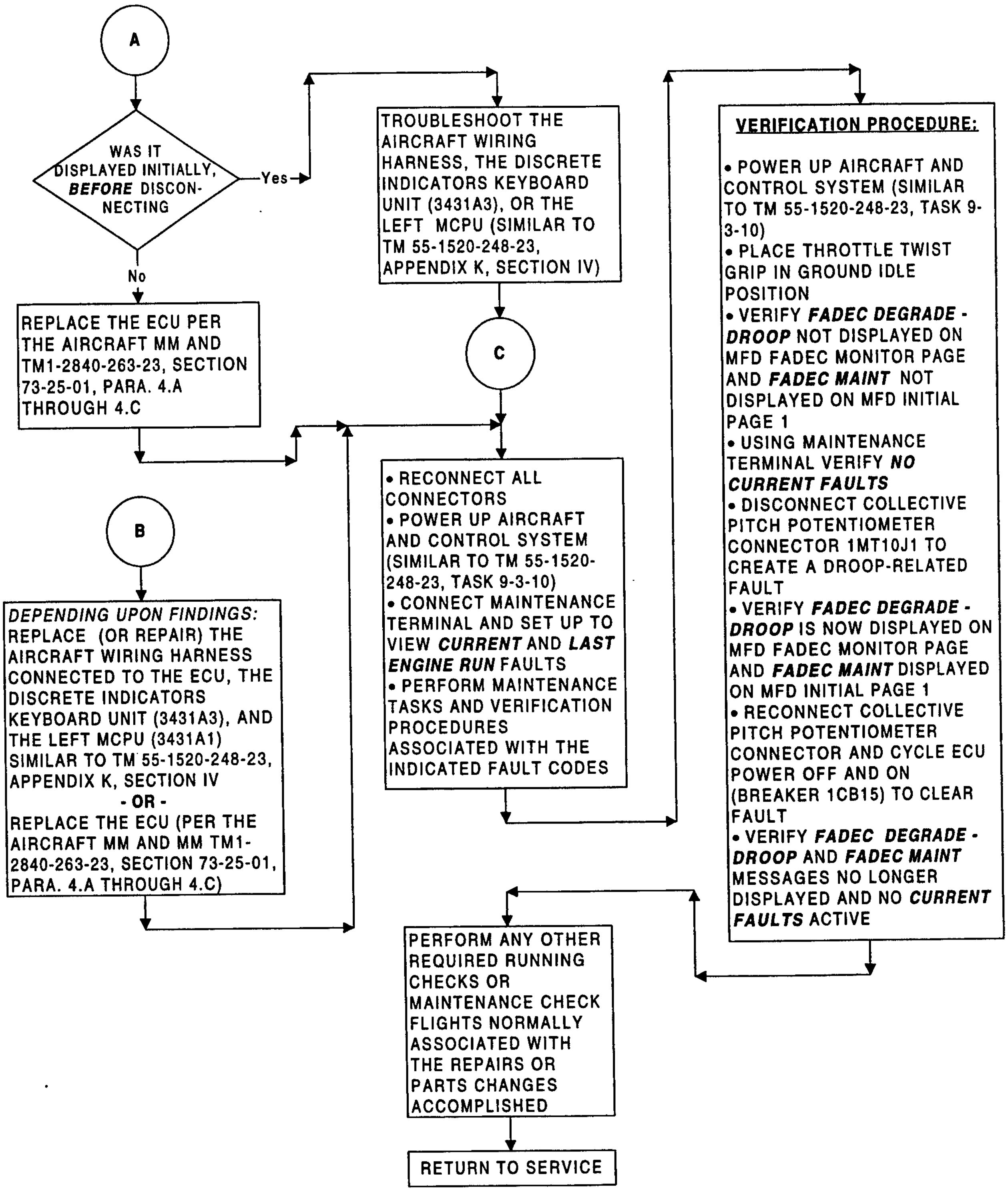
IS ***FADEC MAINT*** ADVISORY DISPLAYED?

Yes → A (PG 2)

No → TROUBLESHOOT THE AIRCRAFT WIRING HARNESS, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), OR THE LEFT MCPU (SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV) → C (PG 2)

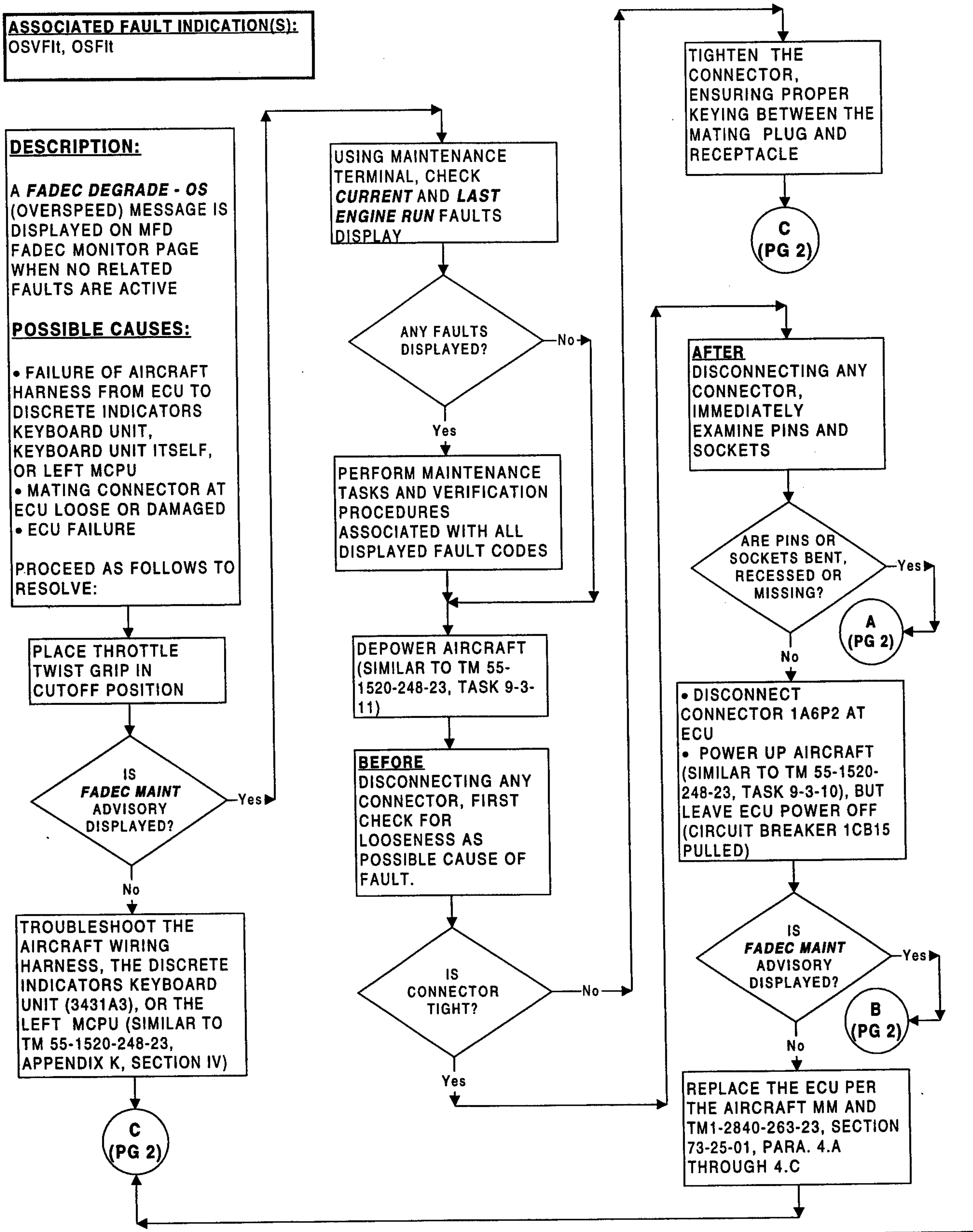
02 SEP 1998

49. *FADEC DEGRADE - DROOP* MESSAGE (MFD) INCORRECTLY "OFF"



02 SEP 1998

50. *FADEC DEGRADE - OS* (OVERSPEED) MESSAGE (MFD) INCORRECTLY "ON"



01 SEP 1998

50. *FADEC DEGRADE - OS* (OVERSPEED) MESSAGE (MFD) INCORRECTLY "ON"

A

DEPENDING UPON FINDINGS:
REPLACE (OR REPAIR) THE AIRCRAFT WIRING HARNESS CONNECTED TO THE ECU, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), AND THE LEFT MCPU (3431A1) SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV

- OR -

REPLACE THE ECU (PER THE AIRCRAFT MM AND MM TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)

B

TROUBLESHOOT THE AIRCRAFT WIRING HARNESS, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), OR THE LEFT MCPU (SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV)

C

VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- PLACE THROTTLE TWIST GRIP IN GROUND IDLE POSITION
- VERIFY ***FADEC DEGRADE - OS*** NOT DISPLAYED ON MFD FADEC MONITOR PAGE AND ***FADEC MAINT*** NOT DISPLAYED ON MFD INITIAL PAGE 1
- USING MAINTENANCE TERMINAL VERIFY NO CURRENT FAULTS
- DISCONNECT HMU CONNECTOR P4 TO CREATE AN OVERSPEED SYSTEM-RELATED FAULT
- VERIFY ***FADEC DEGRADE - OS*** IS NOW DISPLAYED ON MFD FADEC MONITOR PAGE AND ***FADEC MAINT*** DISPLAYED ON MFD INITIAL PAGE 1
- RECONNECT HMU CONNECTOR AND CYCLE ECU POWER OFF AND ON (BREAKER 1CB15) TO CLEAR FAULT
- VERIFY ***FADEC DEGRADE - OS*** AND ***FADEC MAINT*** MESSAGES NO LONGER DISPLAYED

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

01 SEP 1998

51. *FADEC DEGRADE - OS* (OVERSPEED) MESSAGE (MFD) INCORRECTLY "OFF"

ASSOCIATED FAULT INDICATION(S):
OSVFlt, OSFlt

DESCRIPTION:

A ***FADEC DEGRADE - OS*** (OVERSPEED) MESSAGE IS NOT DISPLAYED ON MFD FADEC MONITOR PAGE WHEN ASSOCIATED FAULTS ARE ACTIVE

POSSIBLE CAUSES:

- FAILURE OF AIRCRAFT HARNESS FROM ECU TO DISCRETE INDICATORS KEYBOARD UNIT, KEYBOARD UNIT ITSELF, OR LEFT MCPU
- MATING CONNECTOR AT ECU LOOSE OR DAMAGED
- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- PLACE THROTTLE TWIST GRIP IN CUTOFF POSITION
- CHECK WHETHER ***FADEC MAINT*** ADVISORY IS DISPLAYED ON MFD
- USING MAINTENANCE TERMINAL, CHECK ***CURRENT*** AND ***LAST ENGINE RUN FAULTS*** DISPLAYS

DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT?

No → TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE → C (PG 2)

Yes → **AFTER** DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING?

Yes → B (PG 2)

No →

- DISCONNECT CONNECTOR 1A6P2 AT ECU
- POWER UP AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10), BUT LEAVE ECU POWER OFF (CIRCUIT BREAKER 1CB15 PULLED)
- CONNECT A JUMPER FROM SOCKET 14 TO GROUND AT ECU GROUNDING STRAP
- CHECK MFD FOR ***FADEC MAINT*** ADVISORY

IS ***FADEC MAINT*** ADVISORY DISPLAYED?

Yes → A (PG 2)

No → TROUBLESHOOT THE AIRCRAFT WIRING HARNESS, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), OR THE LEFT MCPU (SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV) → C (PG 2)

02 SEP 1998

51. *FADEC DEGRADE - OS* (OVERSPEED) MESSAGE (MFD) INCORRECTLY "OFF"

A

WAS IT DISPLAYED INITIALLY, ***BEFORE*** DISCON-NECTING

Yes

TROUBLESHOOT THE AIRCRAFT WIRING HARNESS, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), OR THE LEFT MCPU (SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV)

C

No

REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C

B

DEPENDING UPON FINDINGS: REPLACE (OR REPAIR) THE AIRCRAFT WIRING HARNESS CONNECTED TO THE ECU, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), AND THE LEFT MCPU (3431A1) SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV

- OR -

REPLACE THE ECU (PER THE AIRCRAFT MM AND MM TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)

- RECONNECT ALL CONNECTORS
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- CONNECT MAINTENANCE TERMINAL AND SET UP TO VIEW ***CURRENT*** AND ***LAST ENGINE RUN*** FAULTS
- PERFORM MAINTENANCE TASKS AND VERIFICATION PROCEDURES ASSOCIATED WITH THE INDICATED FAULT CODES

VERIFICATION PROCEDURE:

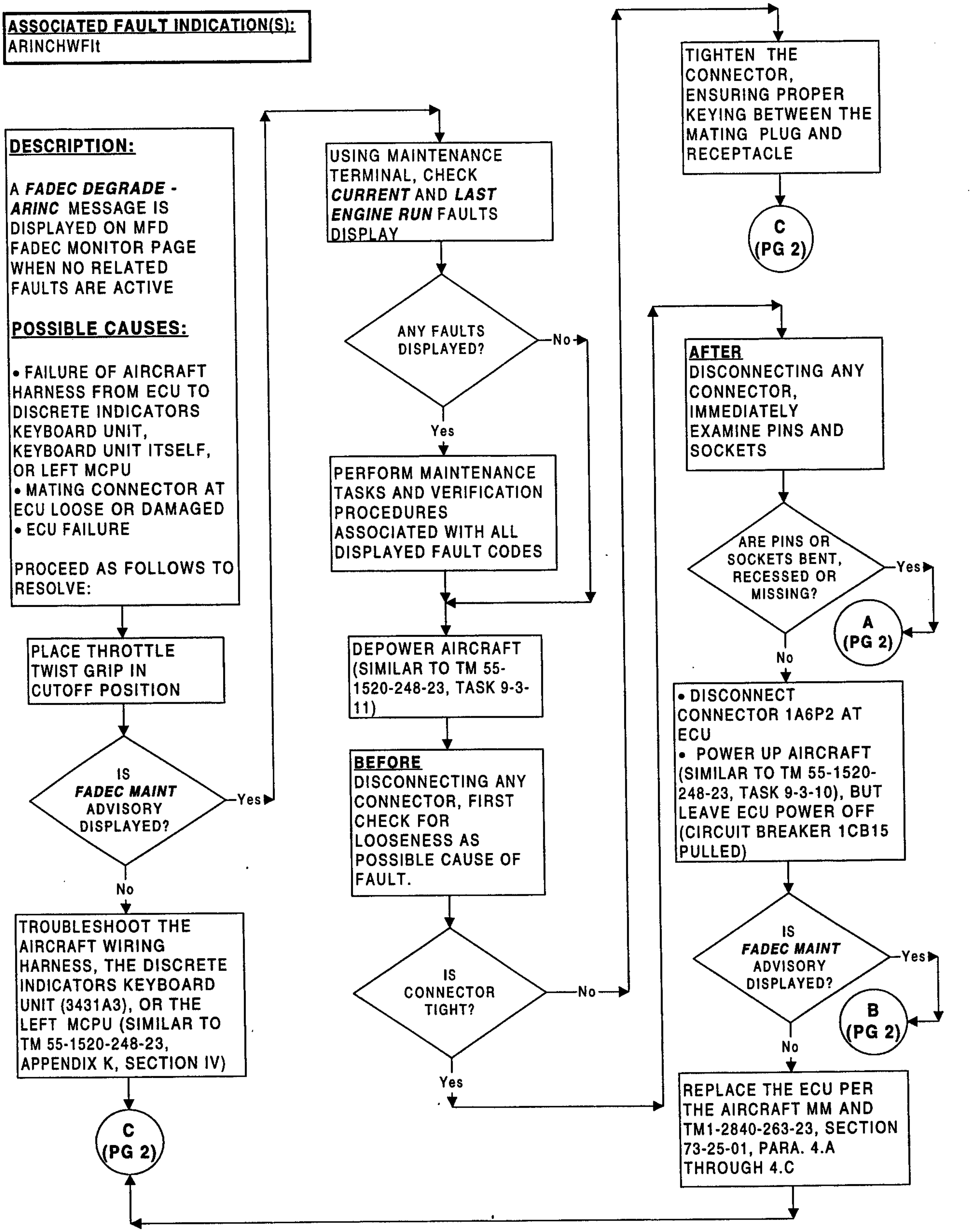
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- PLACE THROTTLE TWIST GRIP IN GROUND IDLE POSITION
- VERIFY ***FADEC DEGRADE - OS*** NOT DISPLAYED ON MFD FADEC MONITOR PAGE AND ***FADEC MAINT*** NOT DISPLAYED ON MFD INITIAL PAGE 1
- USING MAINTENANCE TERMINAL VERIFY NO CURRENT FAULTS
- DISCONNECT HMU CONNECTOR P4 TO CREATE AN OVERSPEED SYSTEM-RELATED FAULT
- VERIFY ***FADEC DEGRADE - OS*** IS NOW DISPLAYED ON MFD FADEC MONITOR PAGE AND ***FADEC MAINT*** DISPLAYED ON MFD INITIAL PAGE 1
- RECONNECT HMU CONNECTOR AND CYCLE ECU POWER OFF AND ON (BREAKER 1CB15) TO CLEAR FAULT
- VERIFY ***FADEC DEGRADE - OS*** AND ***FADEC MAINT*** MESSAGES NO LONGER DISPLAYED AND NO ***CURRENT FAULTS*** ACTIVE

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

02 SEP 1998

52. *FADEC DEGRADE - ARINC* MESSAGE (MFD) INCORRECTLY "ON"



31 AUG 1998

52. *FADEC DEGRADE - ARINC* MESSAGE (MFD) INCORRECTLY "ON"

A

DEPENDING UPON FINDINGS:
REPLACE (OR REPAIR) THE AIRCRAFT WIRING HARNESS CONNECTED TO THE ECU, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), AND THE LEFT MCPU (3431A1) SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV

- OR -

REPLACE THE ECU (PER THE AIRCRAFT MM AND MM TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)

B

TROUBLESHOOT THE AIRCRAFT WIRING HARNESS, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), OR THE LEFT MCPU (SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV)

C

VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- PLACE THROTTLE TWIST GRIP IN GROUND IDLE POSITION
- VERIFY ***FADEC DEGRADE - ARINC*** NOT DISPLAYED ON MFD FADEC MONITOR PAGE AND ***FADEC MAINT*** NOT DISPLAYED ON MFD INITIAL PAGE 1
- USE MAINTENANCE TERMINAL TO VERIFY NO ***CURRENT FAULTS***
- START ENGINE AND OPERATE AT 100% Np, WITH ROTOR IN FLAT PITCH. VERIFY ***FADEC DEGRADE - ARINC*** NOT DISPLAYED ON MFD FADEC MONITOR PAGE AND ***FADEC MAINT*** NOT DISPLAYED ON MFD INITIAL PAGE 1
- SHUT DOWN AND VERIFY NO CURRENT FAULTS OR DEGRADE MESSAGES

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

31 AUG 1998

53. ***FADEC DEGRADE - ARINC*** MESSAGE (MFD) INCORRECTLY "OFF"

ASSOCIATED FAULT INDICATION(S):
ARINCHWDFlt

DESCRIPTION:

A ***FADEC DEGRADE - ARINC*** MESSAGE IS NOT DISPLAYED ON MFD FADEC MONITOR PAGE WHEN ASSOCIATED FAULT IS ACTIVE

POSSIBLE CAUSES:

- FAILURE OF AIRCRAFT HARNESS FROM ECU TO DISCRETE INDICATORS KEYBOARD UNIT, KEYBOARD UNIT ITSELF, OR LEFT MCPU
- MATING CONNECTOR AT ECU LOOSE OR DAMAGED
- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- PLACE THROTTLE TWIST GRIP IN CUTOFF POSITION
- CHECK WHETHER ***FADEC MAINT*** ADVISORY IS DISPLAYED ON MFD
- USING MAINTENANCE TERMINAL, CHECK ***CURRENT*** AND ***LAST ENGINE RUN FAULTS*** DISPLAYS

DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT?

No: TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE → C (PG 2)

Yes:

AFTER DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING?

Yes: B (PG 2)

No:

- DISCONNECT CONNECTOR 1A6P2 AT ECU
- POWER UP AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10), BUT LEAVE ECU POWER OFF (CIRCUIT BREAKER 1CB15 PULLED)
- CONNECT A JUMPER FROM SOCKET 14 TO GROUND AT ECU GROUNDING STRAP
- CHECK MFD FOR ***FADEC MAINT*** ADVISORY

IS ***FADEC MAINT*** ADVISORY DISPLAYED?

Yes: A (PG 2)

No: TROUBLESHOOT THE AIRCRAFT WIRING HARNESS, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), OR THE LEFT MCPU (SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV) → C (PG 2)

02 SEP 1998

53. *FADEC DEGRADE - ARINC* MESSAGE (MFD) INCORRECTLY "OFF"

A

WAS IT DISPLAYED INITIALLY, ***BEFORE*** DISCONNECTING

Yes → TROUBLESHOOT THE AIRCRAFT WIRING HARNESS, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), OR THE LEFT MCPU (SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV) → C

No → REPLACE THE ECU PER THE AIRCRAFT MM AND TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C

B

DEPENDING UPON FINDINGS: REPLACE (OR REPAIR) THE AIRCRAFT WIRING HARNESS CONNECTED TO THE ECU, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), AND THE LEFT MCPU (3431A1) SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV

- OR -

REPLACE THE ECU (PER THE AIRCRAFT MM AND MM TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)

C

- RECONNECT ALL CONNECTORS
- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- CONNECT MAINTENANCE TERMINAL AND SET UP TO VIEW ***CURRENT*** AND ***LAST ENGINE RUN*** FAULTS
- PERFORM MAINTENANCE TASKS AND VERIFICATION PROCEDURES ASSOCIATED WITH THE INDICATED FAULT CODES

C

VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- PLACE THROTTLE TWIST GRIP IN GROUND IDLE POSITION
- VERIFY ***FADEC DEGRADE - ARINC*** NOT DISPLAYED ON MFD FADEC MONITOR PAGE AND ***FADEC MAINT*** NOT DISPLAYED ON MFD INITIAL PAGE 1
- DISCONNECT COLLECTIVE PITCH POTENTIOMETER CONNECTOR (1MT10J1) TO PROVOKE A FAULT
- VERIFY ARINC BUS FUNCTIONAL BY READING 2ND CHARACTER (FROM LEFT) OF ESW1 -- SHOULD BE **4** (BUT IF SOME OTHER ***LAST ENGINE RUN FAULTS*** ARE STILL PRESENT, IT IS ACCEPTABLE IF THE CHARACTER IS 5, 6, 7, C, D, E, OR F)
- ALSO VERIFY ***FADEC DEGRADE - DROOP*** IS NOW DISPLAYED ON MFD FADEC MONITOR PAGE BUT ***FADEC DEGRADE - ARINC*** IS NOT
- RECONNECT COLLECTIVE PITCH POTENTIOMETER CONNECTOR AND CYCLE ECU POWER OFF AND ON (BREAKER 1CB15) TO CLEAR FAULT
- START ENGINE AND OPERATE AT 100% Np, WITH ROTOR IN FLAT PITCH. VERIFY NO ***CURRENT FAULTS*** SHOWING ON MAINTENANCE TERMINAL
- SHUT DOWN AND VERIFY NO CURRENT FAULTS, NO DEGRADE MESSAGES, AND ALL ESWs INDICATING NOTHING BUT ZEROS

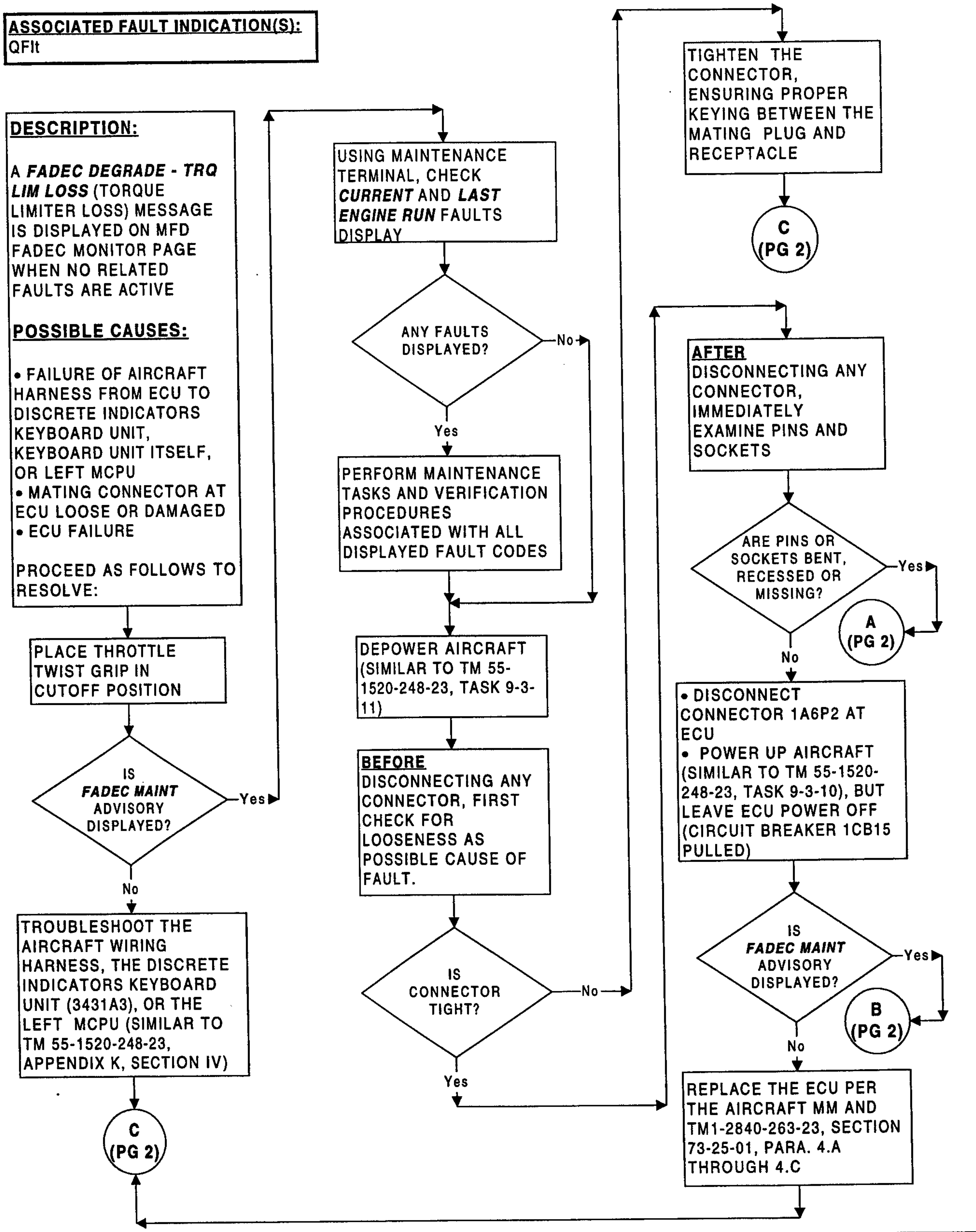
PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

02 SEP 1998

REV. 12 JUL 99

54. *FADEC DEGRADE - TRQ LIM LOSS* MESSAGE (MFD) INCORRECTLY "ON"



01 SEP 1998

54. *FADEC DEGRADE - TRQ LIM LOSS* MESSAGE (MFD) INCORRECTLY "ON"

A

DEPENDING UPON FINDINGS:
REPLACE (OR REPAIR) THE AIRCRAFT WIRING HARNESS CONNECTED TO THE ECU, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), AND THE LEFT MCPU (3431A1) SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV

- OR -

REPLACE THE ECU (PER THE AIRCRAFT MM AND MM TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)

B

TROUBLESHOOT THE AIRCRAFT WIRING HARNESS, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), OR THE LEFT MCPU (SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV)

C

VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- PLACE THROTTLE TWIST GRIP IN GROUND IDLE POSITION
- VERIFY ***FADEC DEGRADE - TRQ LIM LOSS*** NOT DISPLAYED ON MFD FADEC MONITOR PAGE AND ***FADEC MAINT*** NOT DISPLAYED ON MFD INITIAL PAGE 1
- USE MAINTENANCE TERMINAL TO VERIFY NO ***CURRENT FAULTS***
- DISCONNECT TORQUEMETER OIL PRESSURE SENSOR CONNECTOR P10 TO CREATE A TORQUE-RELATED FAULT
- START ENGINE AND OPERATE AT 100% Np, WITH ROTOR IN FLAT PITCH
- VERIFY ***FADEC DEGRADE - TRQ LIM LOSS*** IS DISPLAYED ON MFD FADEC MONITOR PAGE
- SHUT DOWN ENGINE AND RECONNECT TMOP SENSOR CONNECTOR
- CYCLE FADEC POWER OFF AND ON (BREAKER 1CB15)
- START ENGINE AND OPERATE AT 100% Np, WITH ROTOR IN FLAT PITCH
- VERIFY ***FADEC DEGRADE - TRQ LIM LOSS*** IS NOT DISPLAYED ON MFD FADEC MONITOR PAGE
- SHUT DOWN AND VERIFY NO CURRENT FAULTS OR DEGRADE MESSAGES ARE DISPLAYED

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

01 SEP 1998

55. *FADEC DEGRADE - TRQ LIM LOSS* MESSAGE (MFD) INCORRECTLY "OFF

ASSOCIATED FAULT INDICATION(S):
QFlt

DESCRIPTION:

A ***FADEC DEGRADE - TRQ LIM LOSS*** (TORQUE LIMITER LOSS) MESSAGE IS NOT DISPLAYED ON MFD FADEC MONITOR PAGE WHEN ASSOCIATED FAULT IS ACTIVE

POSSIBLE CAUSES:

- FAILURE OF AIRCRAFT HARNESS FROM ECU TO DISCRETE INDICATORS KEYBOARD UNIT, KEYBOARD UNIT ITSELF, OR LEFT MCPU
- MATING CONNECTOR AT ECU LOOSE OR DAMAGED
- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- PLACE THROTTLE TWIST GRIP IN CUTOFF POSITION
- CHECK WHETHER ***FADEC MAINT*** ADVISORY IS DISPLAYED ON MFD
- USING MAINTENANCE TERMINAL, CHECK ***CURRENT*** AND ***LAST ENGINE RUN FAULTS*** DISPLAYS

DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT?

No → TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE → C (PG 2)

Yes → **AFTER** DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING?

Yes → B (PG 2)

No →

- DISCONNECT CONNECTOR 1A6P2 AT ECU
- POWER UP AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10), BUT LEAVE ECU POWER OFF (CIRCUIT BREAKER 1CB15 PULLED)
- CONNECT A JUMPER FROM SOCKET 14 TO GROUND AT ECU GROUNDING STRAP
- CHECK MFD FOR ***FADEC MAINT*** ADVISORY

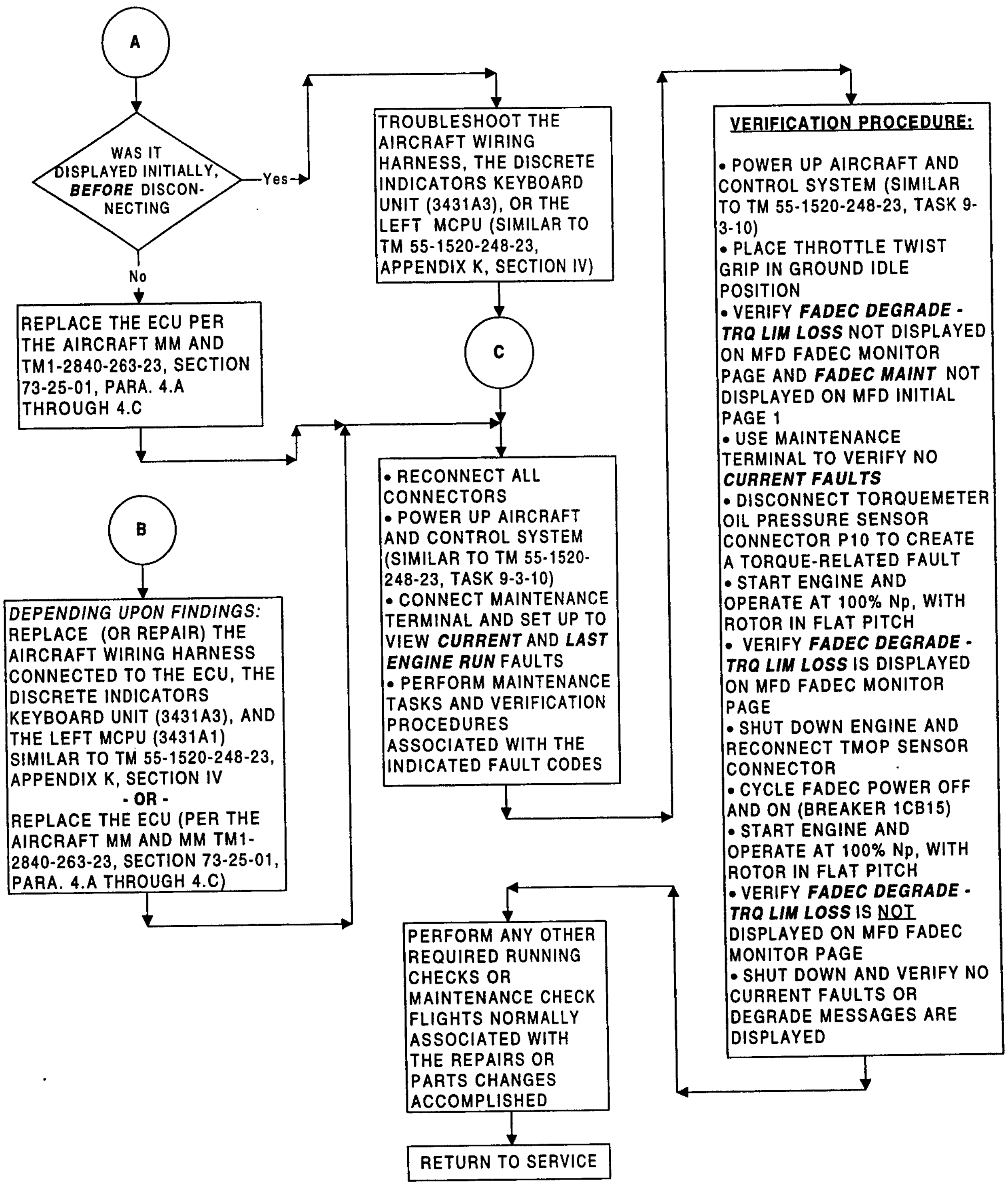
IS ***FADEC MAINT*** ADVISORY DISPLAYED?

Yes → A (PG 2)

No → TROUBLESHOOT THE AIRCRAFT WIRING HARNESS, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), OR THE LEFT MCPU (SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV) → C (PG 2)

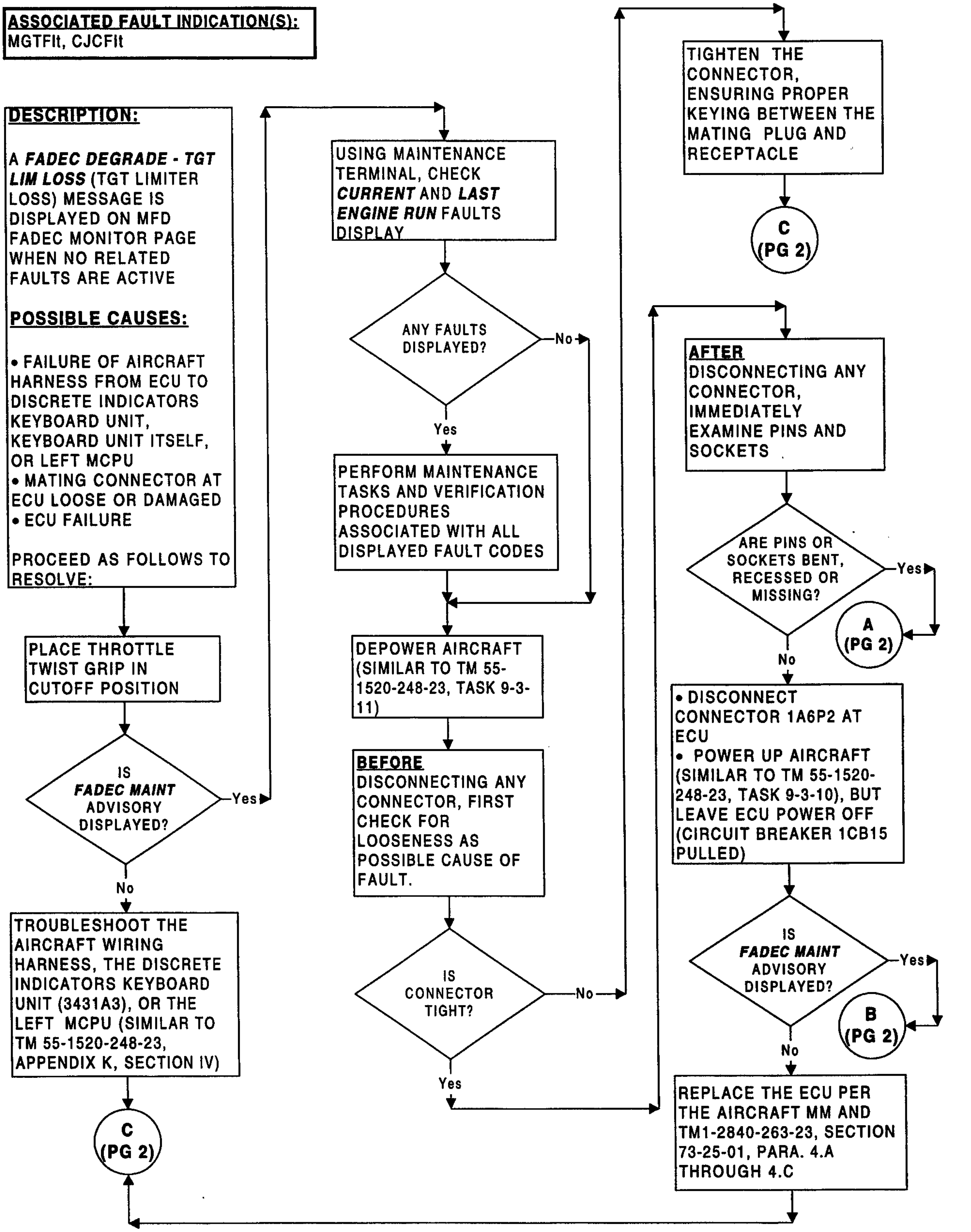
02 SEP 1998

55. *FADEC DEGRADE - TRQ LIM LOSS* MESSAGE (MFD) INCORRECTLY "OFF



02 SEP 1998

56. ***FADEC DEGRADE - TGT* (OR MGT) *LIM LOSS* MESSAGE (MFD) INCORRECTLY "ON"**



01 SEP 1998

56. *FADEC DEGRADE - TGT* (OR MGT) *LIM LOSS* MESSAGE (MFD) INCORRECTLY "ON"

A

DEPENDING UPON FINDINGS:
REPLACE (OR REPAIR) THE AIRCRAFT WIRING HARNESS CONNECTED TO THE ECU, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), AND THE LEFT MCPU (3431A1) SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV

- OR -

REPLACE THE ECU (PER THE AIRCRAFT MM AND MM TM1-2840-263-23, SECTION 73-25-01, PARA. 4.A THROUGH 4.C)

B

TROUBLESHOOT THE AIRCRAFT WIRING HARNESS, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), OR THE LEFT MCPU (SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV)

C

VERIFICATION PROCEDURE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- PLACE THROTTLE TWIST GRIP IN GROUND IDLE POSITION
- VERIFY ***FADEC DEGRADE - TGT LIM LOSS*** NOT DISPLAYED ON MFD FADEC MONITOR PAGE AND ***FADEC MAINT*** NOT DISPLAYED ON MFD INITIAL PAGE 1
- USING MAINTENANCE TERMINAL VERIFY NO ***CURRENT FAULTS***
- TO CREATE AN MGT-RELATED FAULT, DISCONNECT ENGINE ELECTRICAL HARNESS LUGS FROM MGT THERMOCOUPLE HARNESS TERMINAL BLOCK AND LIFT OFF TO PREVENT GROUNDING OR CONTACT WITH EACH OTHER
- VERIFY ***FADEC DEGRADE - TGT LIM LOSS*** IS NOW DISPLAYED ON MFD FADEC MONITOR PAGE AND ***FADEC MAINT*** DISPLAYED ON MFD INITIAL PAGE 1
- RECONNECT ENGINE ACCESSORY HARNESS LUGS TO MGT HARNESS TERMINAL BLOCK AND CYCLE ECU POWER OFF AND ON (BREAKER 1CB15) TO CLEAR FAULT
- VERIFY ***FADEC DEGRADE - TGT LIM LOSS*** AND ***FADEC MAINT*** MESSAGES NO LONGER DISPLAYED

PERFORM ANY OTHER REQUIRED RUNNING CHECKS OR MAINTENANCE CHECK FLIGHTS NORMALLY ASSOCIATED WITH THE REPAIRS OR PARTS CHANGES ACCOMPLISHED

RETURN TO SERVICE

01 SEP 1998

57. *FADEC DEGRADE - TGT* (OR MGT) *LIM LOSS* MESSAGE (MFD) INCORRECTLY "OFF"

ASSOCIATED FAULT INDICATION(S):
MGTFlt, CJCFlt

DESCRIPTION:

A ***FADEC DEGRADE - TGT LIM LOSS*** (TGT LIMITER LOSS) MESSAGE IS NOT DISPLAYED ON MFD FADEC MONITOR PAGE WHEN AN ASSOCIATED FAULT IS ACTIVE

POSSIBLE CAUSES:

- FAILURE OF AIRCRAFT HARNESS FROM ECU TO DISCRETE INDICATORS KEYBOARD UNIT, KEYBOARD UNIT ITSELF, OR LEFT MCPU
- MATING CONNECTOR AT ECU LOOSE OR DAMAGED
- ECU FAILURE

PROCEED AS FOLLOWS TO RESOLVE:

- POWER UP AIRCRAFT AND CONTROL SYSTEM (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10)
- PLACE THROTTLE TWIST GRIP IN CUTOFF POSITION
- CHECK WHETHER ***FADEC MAINT*** ADVISORY IS DISPLAYED ON MFD
- USING MAINTENANCE TERMINAL, CHECK ***CURRENT*** AND ***LAST ENGINE RUN FAULTS*** DISPLAYS

DEPOWER AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-11)

BEFORE DISCONNECTING ANY CONNECTOR, FIRST CHECK FOR LOOSENESS AS POSSIBLE CAUSE OF FAULT.

IS CONNECTOR TIGHT?

No → TIGHTEN THE CONNECTOR, ENSURING PROPER KEYING BETWEEN THE MATING PLUG AND RECEPTACLE → C (PG 2)

Yes → **AFTER** DISCONNECTING ANY CONNECTOR, IMMEDIATELY EXAMINE PINS AND SOCKETS

ARE PINS OR SOCKETS BENT, RECESSED OR MISSING?

Yes → B (PG 2)

No →

- DISCONNECT CONNECTOR 1A6P2 AT ECU
- POWER UP AIRCRAFT (SIMILAR TO TM 55-1520-248-23, TASK 9-3-10), BUT LEAVE ECU POWER OFF (CIRCUIT BREAKER 1CB15 PULLED)
- CONNECT A JUMPER FROM SOCKET 14 TO GROUND AT ECU GROUNDING STRAP
- CHECK MFD FOR ***FADEC MAINT*** ADVISORY

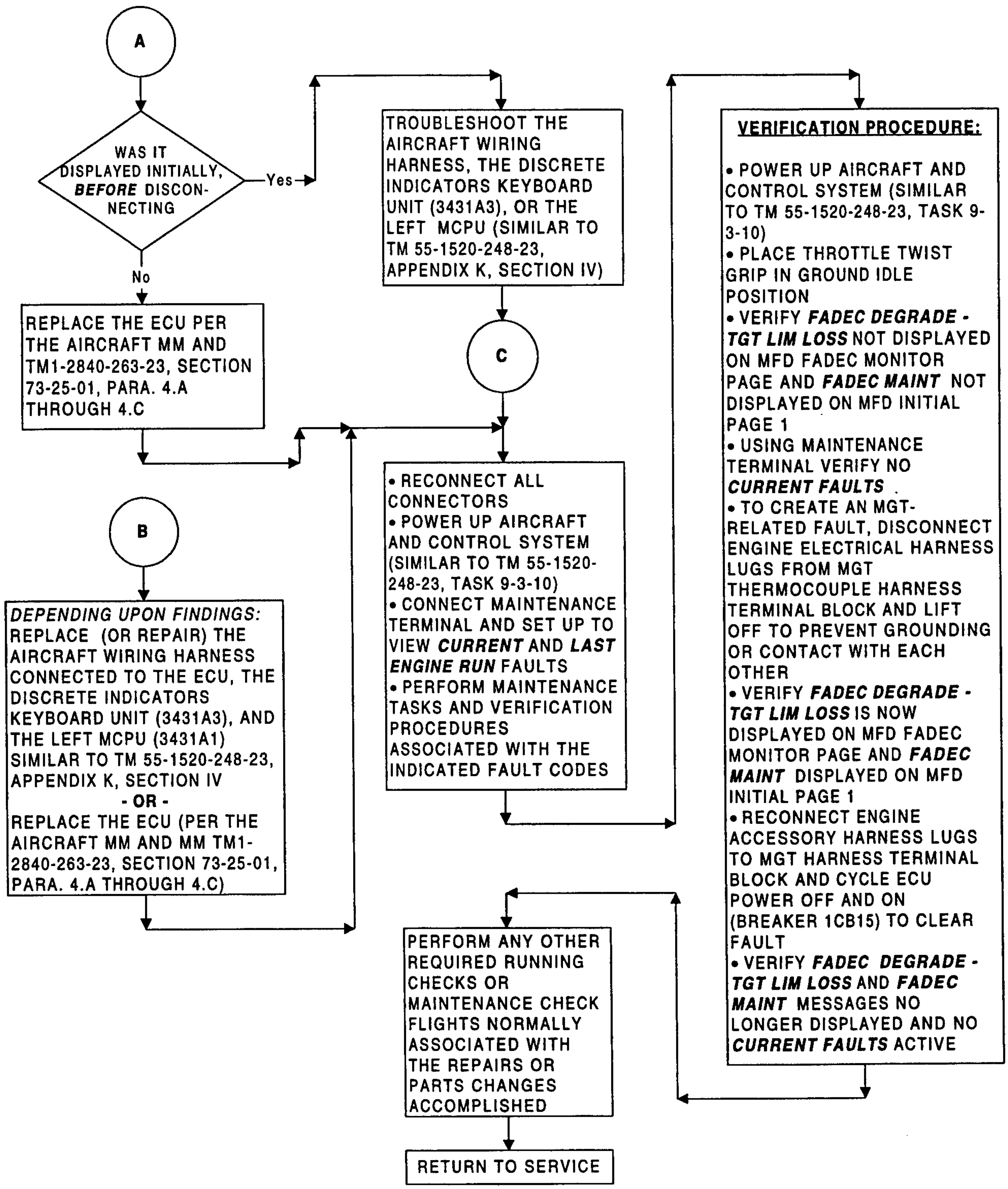
IS ***FADEC MAINT*** ADVISORY DISPLAYED?

Yes → A (PG 2)

No → TROUBLESHOOT THE AIRCRAFT WIRING HARNESS, THE DISCRETE INDICATORS KEYBOARD UNIT (3431A3), OR THE LEFT MCPU (SIMILAR TO TM 55-1520-248-23, APPENDIX K, SECTION IV) → C (PG 2)

02 SEP 1998

57. *FADEC DEGRADE - TGT* (OR MGT) *LIM LOSS* MESSAGE (MFD) INCORRECTLY "OFF"



02 SEP 1998

Appendix D

Standard Generalized Markup Language (SGML) Tagging

- Sample SGML Tagged Data File
- Software Considerations for System Implementation

Appendix D

Alphanumeric Text of Typical SGML-Tagged Fault Correction Procedure (250-C30R/3 Basic Engine Procedure R-6 - Ground Idle Speed Too High or Too Low)


```
<!DOCTYPE PROCINFO PUBLIC "-//Grumman//DTD procinfo//EN" (
<!--ArborText, Inc., 1988-1993, v.4001-->
)>
<procinfo><task id="J-7000---3000028970" name="GROUND IDLE SPEED TOO HIGH OR TOO LOW
START SUBTASK 1"
type="N" itemid="15-SEP-98" version="J-VERSION---3000026679" status="ver"
valtype="a" servicedes="A"><text id="J-7000---3000028971" name="GROUND IDLE SPEED TOO
HIGH OR TOO LOW START SUBTASK 1">
GROUND IDLE SPEED TOO HIGH OR TOO LOW START SUBTASK 1</text>
<step id="J-7200---6000004725" name="**300**R6 GROUND IDLE SPEED TOO
HIGH:X00720001_HGOMAR6"
cdm="node" version="J-VERSION---0000000014" status="ver" esttime="0.0"><text
itemid="14-SEP-98" ref="J-TEXT---6000003811">Inspect HMU control rigging IAW
TMI-2840-263-23, 73-21-01, para 1.D. and adjust as required IAW (similar to)
TM 55-1540-248-23, Task 4-6-1.</text>
<dialog id="J-7000---3000029047" itemid="15-SEP-98" agent="human">
<menu id="J-7000---3000029050"><prompt id="J-7000---3000029051"><text itemid="14-SEP-98"
ref="J-TEXT---6000004091">Was re-rigging necessary?</text></prompt>
<choice id="J-7000---3000029056">
<link id="J-7000---3000029057" linkends="None">Continue
</link><text itemid="26-AUG-98" ref="J-TEXT---3000026520">Yes</text></choice>
<choice id="J-7000---3000029058">
<link id="J-7000---3000029059" linkends="J-7000---3000028972">Task</link><text itemid="26-AUG-98"
ref="J-TEXT---3000026521">No</text></choice></menu></dialog></step>
<step id="J-7200---6000004727" name="**300**R6 GROUND IDLE SPEED TOO
HIGH:X00720001_HGOMAR6"
cdm="node" version="J-VERSION---0000000014" status="ver" esttime="0.0"><text
itemid="14-SEP-98" ref="J-TEXT---6000003907">Perform a start to Ground Idle
twist grip position and determine if Ng is within required speed band.</text>
<dialog id="J-7000---3000029063" itemid="15-SEP-98" agent="human">
<menu id="J-7000---3000029066"><prompt id="J-7000---3000029067"><text itemid="14-SEP-98"
ref="J-TEXT---6000003832">Is Ground Idle Ng OK?</text></prompt>
<choice id="J-7000---3000029070">
<link id="J-7000---3000029071" linkends="None">Continue
</link><text itemid="26-AUG-98" ref="J-TEXT---3000026520">Yes</text></choice>
<choice id="J-7000---3000029072">
<link id="J-7000---3000029073" linkends="J-7000---3000028972">Task</link><text itemid="26-AUG-98"
ref="J-TEXT---3000026521">No</text></choice></menu></dialog></step>
<step id="J-7200---6000004729" name="**300**R6 GROUND IDLE SPEED TOO
HIGH:X00720001_HGOMAR6"
cdm="node" version="J-VERSION---0000000014" status="ver" esttime="0.0"><text
itemid="14-SEP-98" ref="J-TEXT---6000000606">Return to service</text></step>
</task></procinfo>
```

Appendix D
Alphanumeric Text of Typical SGML-Tagged Fault Correction Procedure (250-C30R/3 Basic Engine Procedure R-6 - Ground Idle Speed Too High or Too Low)


```
<!DOCTYPE PROCINFO PUBLIC "-//Grumman//DTD procinfo//EN" (
<!--ArborText, Inc., 1988-1993, v.4001-->
)>
<procinfo><task id="J-7000—3000028972" name="GROUND IDLE SPEED TOO HIGH OR TOO LOW
START SUBTASK 2"
type="N" itemid="15-SEP-98" version="J-VERSION—3000026679" status="ver"
valtype="a" servicedes="A"><text id="J-7000—3000028973" name="GROUND IDLE SPEED TOO
HIGH OR TOO LOW START SUBTASK 2">
GROUND IDLE SPEED TOO HIGH OR TOO LOW START SUBTASK 2</text>
<step id="J-7200—6000004730" name="**300**R6 GROUND IDLE SPEED TOO
HIGH:X00720001_HGOMAR6"
cdm="node" version="J-VERSION—0000000014" status="ver" esttime="0.0"><text
itemid="14-SEP-98" ref="J-TEXT—6000004029">Select Real Time Analog Data
display page on Maintenance Terminal.</text></step>
<step id="J-7200—6000004731" name="**300**R6 GROUND IDLE SPEED TOO
HIGH:X00720001_HGOMAR6"
cdm="node" version="J-VERSION—0000000014" status="ver" esttime="0.0"><text
itemid="14-SEP-98" ref="J-TEXT—6000003908">Perform a start to Ground Idle
twist grip position.</text></step>
<step id="J-7200—6000004732" name="**300**R6 GROUND IDLE SPEED TOO
HIGH:X00720001_HGOMAR6"
cdm="node" version="J-VERSION—0000000014" status="ver" esttime="0.0"><text
itemid="14-SEP-98" ref="J-TEXT—6000003928">Read and compare Ng indication
from cockpit speed indicator and from Maintenance Terminal.</text>
<dialog id="J-7000---3000029425" itemid="15-SEP-98" agent="human">
<menu id="J-7000—3000029426"><prompt id="J-7000—3000029427"><text itemid="14-SEP-98"
ref="J-TEXT---6000003750">Does cockpit Ng agree with Maintenance Terminal?
</text></prompt>
<choice id="J-7000—3000029429">
<link id="J-7000—3000029432" linkends="J-7000—3000028974">Task</link><text itemid="26-AUG-98"
ref="J-TEXT---3000026520">Yes</text></choice>
<choice id="J-7000—3000029435">
<link id="J-7000—3000029438" linkends="None">Continue
</link><text itemid="26-AUG-98" ref="J-TEXT—3000026521">No</text></choice>
</menu></dialog></step>
<step id="J-7200—6000004734" name="**300**R6 GROUND IDLE SPEED TOO
HIGH:X00720001_HGOMAR6"
cdm="node" version="J-VERSION—0000000014" status="ver" esttime="0.0"><text
itemid="14-SEP-98" ref="J-TEXT—6000000599">Replace or repair Multiparameter
Display Ng channel IAW (Similar to TM 55-1520-248-23, Tasks 8-1-5, 8-1-6,
8-1-7, and 8-1-8)</text></step>
<step id="J-7200—6000004735" name="**300**R6 GROUND IDLE SPEED TOO
HIGH:X00720001_HGOMAR6"
cdm="node" version="J-VERSION—0000000014" status="ver" esttime="0.0"><text
itemid="14-SEP-98" ref="J-TEXT—6000004096">Perform a start to Ground Idle
twist grip position and verify that Ng is within required speed band.</text>
</step>
<step id="J-7200—6000004736" name="**300**R6 GROUND IDLE SPEED TOO
HIGH:X00720001_HGOMAR6"
cdm="node" version="J-VERSION—0000000014" status="ver" esttime="0.0"><text
itemid="14-SEP-98" ref="J-TEXT—6000000606">Return to service.</text></step>
</task></procinfo>
```

Appendix D
Alphanumeric Text of Typical SGML-Tagged Fault Correction Procedure (250-C30R/3 Basic Engine Procedure R-6 - Ground Idle Speed Too High or Too Low)


```
<!DOCTYPE PROCINFO PUBLIC "-//Grumman//DTD procinfo//EN" [
<!--ArborText, Inc., 1988-1993, v.4001-->
]>
<procinfo><task id="J-7000---3000028974" name="GROUND IDLE SPEED TOO HIGH OR TOO LOW
START SUBTASK 3"
type="N" itemid="15-SEP-98" version="J-VERSION---3000026679" status="ver"
valtype="a" servicedes="A"><text id="J-7000---3000028975" name="GROUND IDLE SPEED TOO
HIGH OR TOO LOW START SUBTASK 3">
GROUND IDLE SPEED TOO HIGH OR TOO LOW START SUBTASK 3</text>
<step id="J-7200---6000004737" name="**300**R6 GROUND IDLE SPEED TOO
HIGH:X00720001_HGOMAR6"
cdm="node" version="J-VERSION---0000000014" status="ver" esttime="0.0"><text
itemid="14-SEP-98" ref="J-TEXT---6000003953">Remove and replace ECU IAW (similar
to) TM 55-1520-248-23, Tasks 9-7-2* and 9-7-3.</text></step>
<step id="J-7200---6000004738" name="**300**R6 GROUND IDLE SPEED TOO
HIGH:X00720001_HGOMAR6"
cdm="node" version="J-VERSION---0000000014" status="ver" esttime="0.0"><text
itemid="14-SEP-98" ref="J-TEXT---6000003905">Perform a start and determine
whether Ng is within required speed band</text>
<dialog id="J-7000---3000029456" itemid="15-SEP-98" agent="human">
<menu id="J-7000---3000029457"><prompt id="J-7000---3000029458"><text itemid="14-SEP-98"
ref="J-TEXT---6000003832">Is Ground Idle Ng OK?</text></prompt>
<choice id="J-7000---3000029462">
<link id="J-7000---3000029465" linkends="J-7000---3000027300">Task</link><text itemid="26-AUG-98"
ref="J-TEXT---3000026520">Yes</text></choice>
<choice id="J-7000---3000029475">
<link id="J-7000---3000029476" linkends="None">Continue
</link><text itemid="26-AUG-98" ref="J-TEXT---3000026521">No</text></choice>
</menu></dialog></step>
<step id="J-7200---6000004740" name="**300**R6 GROUND IDLE SPEED TOO
HIGH:X00720001_HGOMAR6"
cdm="node" version="J-VERSION---0000000014" status="ver" esttime="0.0"><text
itemid="14-SEP-98" ref="J-TEXT---6000000495">Remove and replace HMU IAW TMI-2840-263-23,
73-21-01, para 1.A. and 1.B.</text></step>
<step id="J-7200---6000004741" name="**300**R6 GROUND IDLE SPEED TOO
HIGH:X00720001_HGOMAR6"
cdm="node" version="J-VERSION---0000000014" status="ver" esttime="0.0"><text
itemid="14-SEP-98" ref="J-TEXT---6000003906">Perform a start and verify that
Ng is within required speed band.</text></step>
<step id="J-7200---6000004742" name="**300**R6 GROUND IDLE SPEED TOO
HIGH:X00720001_HGOMAR6"
cdm="node" version="J-VERSION---0000000014" status="ver" esttime="0.0"><text
itemid="14-SEP-98" ref="J-TEXT---6000000606">Return to service</text></step>
</task></procinfo>

<!DOCTYPE PROCINFO PUBLIC "-//Grumman//DTD procinfo//EN" [
<!--ArborText, Inc., 1988-1993, v.4001-->
]>
<procinfo><task id="J-7000---3000028945" name="GROUND IDLE SPEED TOO HIGH OR TOO LOW
START"
type="N" itemid="15-SEP-98" version="J-VERSION---3000026679" status="ver"
valtype="a" servicedes="A">
<link id="J-7000---3000031876" linkends="T703">Partinfo
```

Appendix D

Alphanumeric Text of Typical SGML-Tagged Fault Correction Procedure (250-C30R/3 Basic Engine Procedure R-6 - Ground Idle Speed Too High or Too Low)

</link><text id="J-7000---3000028955" name="GROUND IDLE SPEED TOO HIGH OR TOO LOW START">
GROUND IDLE SPEED TOO HIGH OR TOO LOW START</text>
<step id="J-7200---6000004714" name="**300**R6 GROUND IDLE SPEED TOO HIGH:X00720001_HGOMAR6"
itemid="08-OCT-98" cdm="node" version="J-VERSION---3000026679" status="ver"
esttime="2.0"><text itemid="14-SEP-98" ref="J-TEXT---6000003770">Ground Idle
gas generator speed (Ng) is NOT adjustable, nor is there a speed modulation
range below Ground Idle.</text></step>
<step id="J-7200---6000004715" name="**300**R6 GROUND IDLE SPEED TOO HIGH:X00720001_HGOMAR6"
cdm="node" version="J-VERSION---0000000014" status="ver" esttime="0.0"><text
itemid="14-SEP-98" ref="J-TEXT---6000003803">If the throttle lever angle on
the HMU is between 12 and 40 degrees, Ng must be 64% + TBD%. If not within
this speed band, maintenance action is required.</text></step>
<step id="J-7200---6000004716" name="**300**R6 GROUND IDLE SPEED TOO HIGH:X00720001_HGOMAR6"
cdm="node" version="J-VERSION---0000000014" status="ver" esttime="0.0"><text
itemid="14-SEP-98" ref="J-TEXT---6000003842">Likely causes of improper Ng
at Ground Idle are:</text>
<table id="J-7000---3000028976" frame="all"><tgroup cols="1" colsep="1" rowsep="1">
<colspec colwidth="456*"><tbody><row><entry valign="middle" align="center">CAUSES OF
IMPROPER Ng AT GROUND IDLE</entry>
</row><row><entry valign="top" align="left">Misrigging
of the twist grip to HMU throttle linkage</entry></row><row><entry valign="top"
align="left">Cockpit Ng instrumentation error
</entry></row><row><entry valign="top" align="left">HMU
</entry></row><row><entry valign="top" align="left">ECU
</entry></row></tbody></tgroup></table></step>
<step id="J-7200---6000004721" name="**300**R6 GROUND IDLE SPEED TOO HIGH:X00720001_HGOMAR6"
cdm="node" version="J-VERSION---0000000014" status="ver" esttime="0.0"><text
itemid="14-SEP-98" ref="J-TEXT---6000003785">If an out-of-limits Ground Idle
Ng condition is encountered, connect Maintenance Terminal and determine whether
FADEC faults are indicated. If so, perform maintenance actions as required
to clear.</text>
<dialog id="J-7000---3000028995" itemid="15-SEP-98" agent="human">
<menu id="J-7000---3000028996"><prompt id="J-7000---3000028997"><text itemid="14-SEP-98"
ref="J-TEXT---6000000718">Was the ECU or HMU replaced?</text></prompt>
<choice id="J-7000---3000029006">
<link id="J-7000---3000029007" linkends="None">Continue
</link><text itemid="26-AUG-98" ref="J-TEXT---3000026520">Yes</text></choice>
<choice id="J-7000---3000029010">
<link id="J-7000---3000029012" linkends="J-7000---3000028970">Task</link><text itemid="26-AUG-98"
ref="J-TEXT---3000026521">No</text></choice></menu></dialog></step>
<step id="J-7200---6000004722" name="**300**R6 GROUND IDLE SPEED TOO HIGH:X00720001_HGOMAR6"
cdm="node" version="J-VERSION---0000000014" status="ver" esttime="0.0"><text
itemid="14-SEP-98" ref="J-TEXT---6000003907">Perform a start to Ground Idle
twist grip position and determine if Ng is within required speed band.</text>
<dialog id="J-7000---3000029032" itemid="15-SEP-98" agent="human">
<menu id="J-7000---3000029033"><prompt id="J-7000---3000029034"><text itemid="14-SEP-98"
ref="J-TEXT---6000003832">Is Ground Idle Ng OK?</text></prompt>
<choice id="J-7000---3000029035">

Appendix D
Alphanumeric Text of Typical SGML-Tagged Fault Correction Procedure (250-C30R/3 Basic Engine Procedure R-6 - Ground Idle Speed Too High or Too Low)

<link id="J-7000---3000029036" linkends="None">Continue
</link><text itemid="26-AUG-98" ref="J-TEXT---3000026520">Yes</text></choice>
<choice id="J-7000---3000029037">
<link id="J-7000---3000029038" linkends="J-7000---3000028970">Task</link><text itemid="26-AUG-98"
ref="J-TEXT---3000026521">No</text></choice></menu></dialog></step>
<step id="J-7200---6000004724" name="**300**R6 GROUND IDLE SPEED TOO
HIGH:X00720001_HGOMAR6"
cdm="node" version="J-VERSION---0000000014" status="ver" esttime="0.0"><text
itemid="14-SEP-98" ref="J-TEXT---6000000606">Return to service</text></step>
</task></procinfo>

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T703 -C30R3 Troubleshooting Data SGML Development

- **Software Overview**
- JSTARS Integrated Maintenance Information System (JIMIS) authoring software.
- JIMIS
  - JSTARS is an Air Force Acquisition Program for the next generation AWACS.
  - The technical data portion of JIMIS provides maintenance with a level 4 Integrated Electronic Technical Manual (IETM).
  - Developed by Northrop Grumman as a piece of an overall maintenance information system.
  - Uses Commercial Off The Shelf (COTS) software in conjunction with Northrop Grumman authoring Document Type Definition (DTD) and presentation system software Formatting Output Specification Instance (FOSI).
    - Oracle database
    - Adept Publishing (SGML tagging)
    - Intercap Metalink for graphics

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T703 -C30R3 Troubleshooting Data SGML Development

- SGML Data Types
  - The JIMIS IETM authoring and presentation software contains many different types of data for use in aircraft maintenance. In addition to the types listed below JIMIS includes parts information, graphics, reference material, tools, support equipment and more. Due to the scope of this project only the following have been used:
  - Tasks
    - Contains all the other data types
  - Steps
    - Contain text and dialogs (graphics if used)
  - Text
    - Authored once used many times (cuts down size of database)
  - Dialogs
    - Present choices which will determine what will be seen next, are made up of the following data types:
      - Menu - Presents viewer with a question or selection
      - Prompt - Question or selection criteria
      - Choice - Displays possible answer or choice
      - Links - Three types Task, Dialog, Continue. Task provides avenue to next path , Dialog if additional questions are required, Continue if additional steps are required in current troubleshooting path.

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T703 -C30R3 Troubleshooting Data SGML Development

- TASK CONSTRUCTION

Task - **STARTER WILL NOT MOTOR ENGINE**

Step- ID# 300001000

Text - ID# 300001001

Check electrical connections on starter

Dialog-ID# 300001002

Menu-ID# 300001003

Prompt - ID # 300001004

Text - ID # 300001005

Are connections secure?

Choice - ID # 300001006

Link - ID # 300001007

Text - ID # 300001008

Yes

Choice - ID # 300001009

Link - ID # 300001010

Text - ID # 30000100011

No

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T703 -C30R3 Troubleshooting Data SGML Development

- Task Development
  - Source data in the form Visio troubleshooting charts.
  - Copied text from charts into Excel, exported into a database then ran through a filter.
  - Filter creates pseudo tasks (assigns step and text tags with ID numbers). Filter creates one pseudo task for each troubleshooting chart.
  - Used pseudo task to build tasks (multiple tasks created to facilitate multiple troubleshooting paths).
  - Created dialog and linking information (links used to join dialogs and tasks together).
  - Created information in authoring in order to allow display in presentation (FOSI).
  - Performed Quality Check to insure tasks matched each path of the troubleshooting charts.

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T703 -C30R3 Troubleshooting Data SGML Development

- **DTD:** (Document Type Definition) A DTD is the formal definition of the elements, structures, and rules for marking up a given type of SGML document. You can store a DTD at the beginning of the document or externally in a separate file.
- **FOSI:** (Formatting Output Specification Instance) A FOSI is used for formatting SGML documents for printing and other outputs. It is a separate file that contains formatting information for each element in a document.

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Appendix E

Test Equipment Required to Perform Troubleshooting/Diagnostic Tasks

SPECIAL TEST EQUIPMENT REQUIRED TO PERFORM MAINTENANCE TASKS

1. **Thermocouple Simulator/Calibrator**, such as OMEGA Model CL-300-1000C-K or equivalent, for measured gas temperature

2. **Pressure Transducer and Readout**, 0 - 150 psig, for main oil pressure and torque sensor pressure (accuracy ± 1.0% of full scale).

3. **FADEC Maintenance Terminal** -- a laptop PC with specialized software, that communicates with the FADEC through the aircraft mounted FADEC test port. This could be the same PC used by the mechanic to maintain the engine.

4. **Electrical Connectors, with stub wires attached to all active pins or sockets**, to mate to the following engine and aircraft connectors (ref. Rolls-Royce Allison Electrical Installation Connection Diagram), for use in performing electrical continuity and resistance checks of electrical and electronic components: 1A6P1, 1A6P2, 1A8J1, 1A9J1, 1J12, 1MT10P1, 1P2, 1P3, 1P10. 4A2J1, J4, J7, J10, J11, AND P6.

5. **Frequency Generator**, to simulate signals from Ng and Np speed pick-ups. Requirements: ***frequency*** 2 Khz to 20 Khz, ***input impedance*** 100W to 150W.

6. **Volt-Ohm Meter**, for use in performing electrical continuity and resistance checks of electrical and electronic components, particularly as related to the FADEC. Requirements: ***voltage*** - accuracy of ± 0.1% of full scale on 200 volt range; ***resistance*** - accuracy of ± 0.05% of full scale on 200 ohm range, ± 0.5% all other ranges, able to measure 50 milliohms within ± 5 milliohms using a 4-wire configuration, must not supply more than 5 milliamperes when measuring potentiometer resistances as excess current may cause damage.

These items of equipment could be configured as individual modules or integrated into a single unit

Applicability to Fault Correction Procedures

T703-AD-700 ENGINE

FAULT ITEM NO.*	TEST EQUIPMENT ITEM NO.**
ST-5	1
ST-6	1
RG-4	5
RG-5	5
RG-6	5
RGF-5	5
RGF-12	2
RGF-13	2
RGF-14	2
RGF-15	2
RGF-16	2
RF-1	1, 2, 5
RF-3	1

250-C30R/3 BASIC ENGINE

FAULT ITEM NO.*	TEST EQUIPMENT ITEM NO.**	FAULT ITEM NO.*	TEST EQUIPMENT ITEM NO.**
ST-2	3	R-10	3, 5
ST-3	3	R-13	2
ST-4	3	R-14	2
ST-5	3	R-15	2
ST-6	3	R-16	2
ST-7	3	R-22	1, 3
ST-8	3	R-23	3
ST-9	1, 3, 6	R-24	3
ST-10	2	R-25	2
R-1	6	R-26	2
R-2	3	R-27	2, 3
R-4	3	R-28	3
R-6	3	R-29	3
R-8	1, 3	R-30	2
R-9	3	SD-3	2

250-C30R/3 FADEC

FAULT ITEM NO.*	TEST EQUIPMENT ITEM NO.**	FAULT ITEM NO.*	TEST EQUIPMENT ITEM NO.**
1	3, 4, 6	30	3
2	3, 4, 6	31	3, 4, 6
3	3, 4, 6	32	3, 4, 6
4	3, 4, 6	33	3, 4, 6
5	3, 4, 6	34	3, 4, 6
6	3, 4, 6	35	3
7	3, 4, 6	36	3, 4, 6
8	3, 4, 6	37	3
9	3, 4, 6	38	3
10	3, 4, 6	39	3
11	3, 4, 6	40	3
12	3, 4, 6	41	3, 5
13	3, 4, 6	42	3, 4
14	3, 4, 6	43	3
15	3	44	3
16	3	45	3
17	3, 4, 6	46	3
18	3, 4, 6	47	3, 4, 6
19	3, 4, 6	48	3
20	3, 4	49	3
21	3, 4, 6	50	3
22	3	51	3
23	3, 4, 6	52	3
24	3	53	3
25	3	54	3
26	3, 4, 6	55	3, 4
27	3	56	3
28	3	57	3, 4
29	3		

****FAULT ITEM NO.*** REFERS TO MAINTENANCE FAULTS LISTED IN TABLES I, II, AND III

*****TEST EQUIPMENT ITEM NO.*** REFERS TO ABOVE LIST OF SPECIAL TEST EQUIPMENT